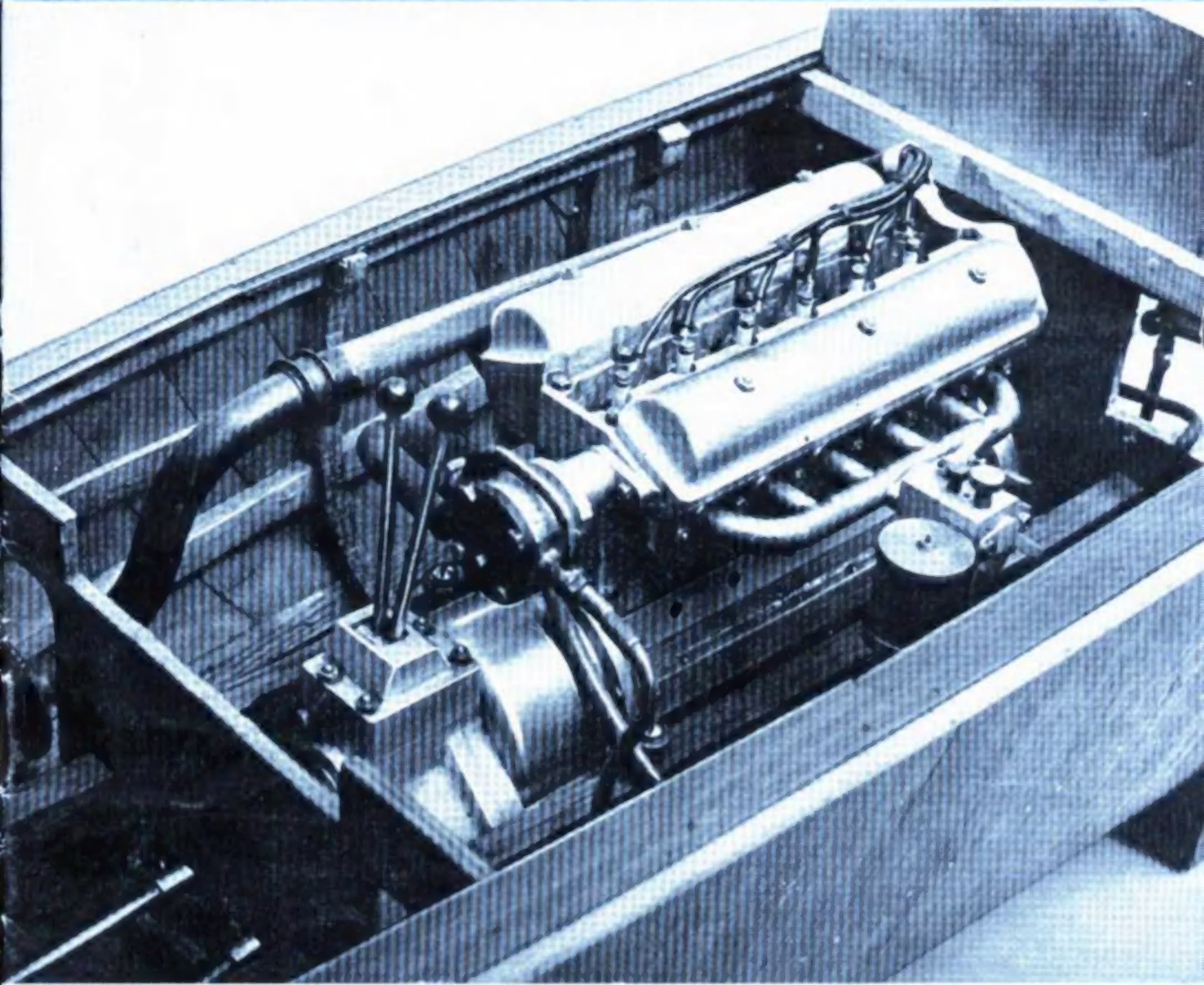
THE MODEL ENGINEER



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THE MODEL ENGINEER

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Our Cover Picture

One of the most outstanding examples of design and workmanship in small internal combustion engines is the six-cylinder engine shown in this photograph, the first instalment of a detailed description of which appears elsewhere in this issue. The constructor, Mr. F. W. Waterton, is one of the most active members of the Altrincham Model Power Boat Club, and has produced many excellent engines and boats, including a steam-driven model of the tug *Acklam Cross*, which won the Spectator Cup in the 1938 "M.E." Exhibition, an ingenious petrol power plant with Aspin rotary valve gear, and the engine shown here, which won a silver medal at the 1951 Exhibition. He is also well known as an electrical experimenter and has done much to develop miniature high-tension magnetos; the one fitted to this engine is practically reduced to scale proportions, and is complete with distributor and gearing; it performs its function quite efficiently and reliably.

SMOKE RINGS

Our Index

READERS WILL notice that this issue contains an index to the volume now closing. This has been found possible because, owing to our larger page size, the former eight-page index has been condensed into fewer pages.

We intend, in future, to include an index in the last issue of each volume as in pre-war years. We believe that the great majority of our readers prefer this; it is not only more convenient and useful, but it avoids the necessity for writing in for a separate printed leaflet.

"Royal Journey" Exhibition

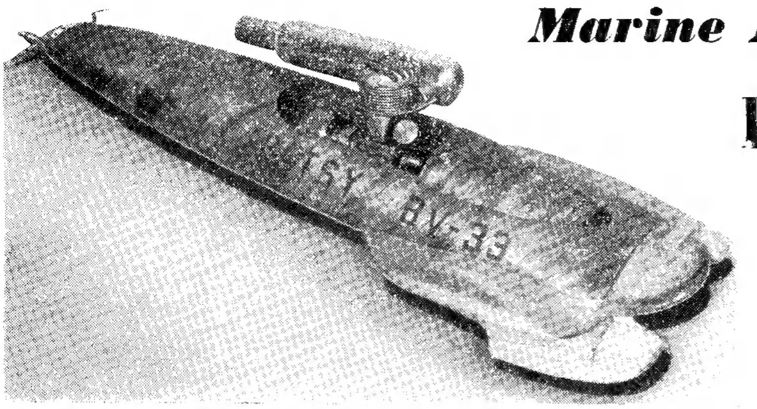
THE BRITISH Transport Commission has arranged, as its contribution to the Coronation festivities, a most attractive exhibition at Battersea Wharf station, Chelsea Bridge. Under the title of "Royal Journey" the display records the development of Royal travel on the railways of Britain. Examples of early and modern coaches used by our Royal Family, since the time of Queen Adelaide, consort of King William IV, are on view, as well as a number of models to fill gaps that cannot be filled by full-size exhibits.

To locomotive lovers in the south, the presence of the *ex*-Caledonian Railway's celebrated 4-2-2 engine No. 123 is of outstanding interest and importance; we believe that this engine has not previously been seen south of Carlisle, and we have little doubt due homage will be paid to her by all southerners who are able to go to Battersea during the period of the exhibition, which lasts until July 11th.

The exhibition is within a few minutes' walk of Battersea Park and Queen's Road (Battersea) Southern Region stations; it can also be reached by bus 137 or special Festival Gardens service from Sloane Square (Underground) station. The site is at the south end of Chelsea Bridge, and exactly opposite the east side of Battersea Park.

Airscrew-propelled Cycles ?

A DESCRIPTION appeared recently in the daily press of a newly-invented (?) power pack for cyclists, constructed in Germany, and comprising a 49 c.c. two-stroke engine driving a pusher airscrew, the entire unit being strapped on the rider's back. This has prompted some of our readers to ask what we think of the practicability of such a scheme, which certainly has the merit of simplicity, and would be within the constructional capacity of many model engineers. The idea of airscrew propulsion for road vehicles is, of course, quite an old one; in the early decades of this century a well-known racing driver, the late Mr. S. F. Edge, made experiments on Brooklands track with a Gnome rotary aircraft engine mounted on a chassis. Reference was also made, in the description of the "Busy Bee" auxiliary engine, to early experiments with a 50 c.c. engine mounted on the handle-bars of a cycle, and driving a tractor airscrew. As a means of propulsion, the idea certainly works, and despite the inevitably low efficiency of an airscrew when running under these particular conditions, the tractive effort would be sufficiently high to give a fair road performance, depending on the general design and its execution. But as a practical aid to the cyclist, we have very grave doubts of its efficacy. In the particular case referred to, it would appear almost impossible for the cyclist to start up his engine without outside assistance, and the effects of vibration and torque reaction might cause some discomfort. The most serious objection to such a device, however, would be its effect on other road users, particularly in the conditions of traffic which exist in this country, in urban areas and on main roads. We are of the opinion that a cyclist would not get very far without finding himself very unfavourably regarded by the police; and if there is not already a law against this method of propulsion, we think there soon would be!



Marine Models at the BIRMINGHAM EXHIBITION

Described by "NORTHERNER"

A well-finished 10-c.c. hydroplane built by E. E. Wakeman, of Bournville

AMONG the many excellent power-boats at Birmingham were three by A. T. Judd, of the home club, all built to 4 mm. scale, and all free-lance in the better sense of the term : that is, incorporating correct detail as typical of the prototype class, but not depicting any particular example of that class. It is Mr. Judd's intention to build more free-lance models of other types of vessel, all to the same scale, so that eventually he will possess a fleet of craft of various sizes and types, all correctly detailed and convenient for comparison.

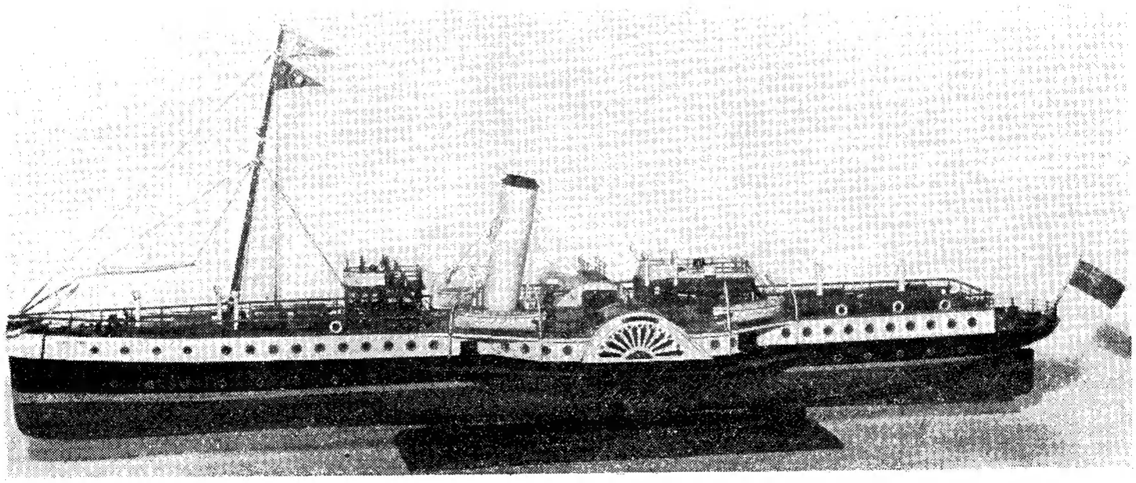
A photograph of his drifter *Girl Pat* was given with my preliminary account of the exhibition, and his model paddle steamer *Glen Esk* is shown herewith. This was an imaginary addition to the fleet of P. and A. Campbell, well known to visitors to the west and south-west coasts, and was a good representative model of the type. The hull was carved from the solid, and had the typical long slim lines and shallow draught of the prototype. Drive was by electric motor, and the paddles were non-feathering, since the scale was so small.

The finish was good, but not quite so good, I thought, as on Mr. Judd's model S.S. *Eleftheria*, which had won the Wellingham Cup at the 1951 MODEL ENGINEER Exhibition, and was one of the "celebrity models" at the 1952 show. The model represented a British-built coaster under Greek ownership, and the name on the stern was painted in very neat Greek characters. In fact, all the paintwork was exceptionally neat, and so was the rest of the work—even the tiny engine-room telegraphs were there on the bridge. The boats and davits were beautifully done, and a typical touch—though one not often seen—was the "motor-tyres" hung from the bulwarks to act as fenders. This vessel, too, was carved from the solid, and was electrically-propelled.

10-c.c. Hydroplane

A power-boat of an entirely different sort was the 10-c.c. hydroplane built by E. E. Wakeman, of the Bournville M.Y.P.B.C. Fitted with a Hornet two-stroke engine, the boat was a very nice piece of craftsmanship—one almost said "cabinet-making."

The shell of the hull was built in two parts, upper and lower, which were constructed separately on moulds, and cemented together subsequently. The skin itself is of three plies, made of individually fitted veneer planks, applied over each other, and is thus of strong but light construction. As will be noticed, the hull rides on three



Typical of the paddle-steamers which grace the British coast in summer was this free-lance model by A. T. Judd

points—side-sponsons and stern—and the wood is left natural colour, but with a high gloss finish.

Quite a number of other models in the marine section came from Bournville too, including a very nice 1-in. scale cabin cruiser powered by a flash steam unit, by W. J. Williams, a paddle steamer with feathering paddles, built by D. P. Wakeman, a 10-c.c. hydroplane by C. E. Stanworth, with engine by C. G. Stanworth, and several model yachts. One of the latter, a 10-rater, *Opal*, had won the National Championship in 1951.

Yacht Builders' Craftsmanship

Incidentally, have you noticed how rarely one sees anything but first-class workmanship on model yachts? In bread-and-butter hulls the joints are usually hair-lines, in planked hulls the fitting is well-nigh perfect, the varnishing and paintwork generally is beyond reproach, and the masts, yards, and sails are neat and workmanlike. There are exceptions, of course, but these seem few and far between.

Returning to power-boats, E. Sheppard, of Nottingham, exhibited a large model based on the Dutch motor tug *Thames*. I am told that this was built without drawings, with only a small picture for guidance. The model had a shapely hull, with excellent paintwork, but the deck fittings and upperworks were unfinished. However, it was noticeable that those countersunk screws obtruded themselves again, holding down the plates to which the stanchions were soldered.

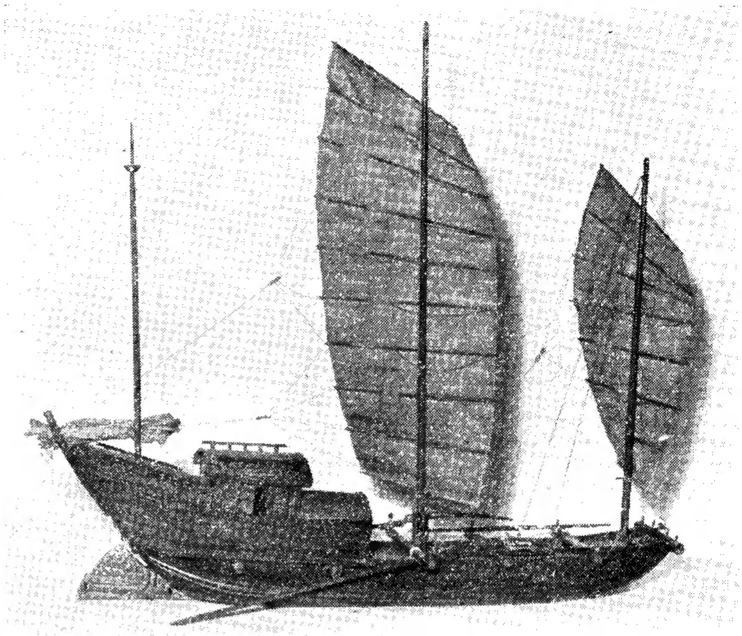
Native-built Models

Two uncommon and very interesting models were those exhibited by N. Lishman, of the Birmingham S.M.S. They were both built by native craftsmen: one was an Indian Kotia Dhow, lateen-rigged, and the other a Chinese Junk of the Yangtze-Kiang. It was a pity that these models were too far from the edge of the stand to be seen properly, but I did manage to secure a photograph of the junk.

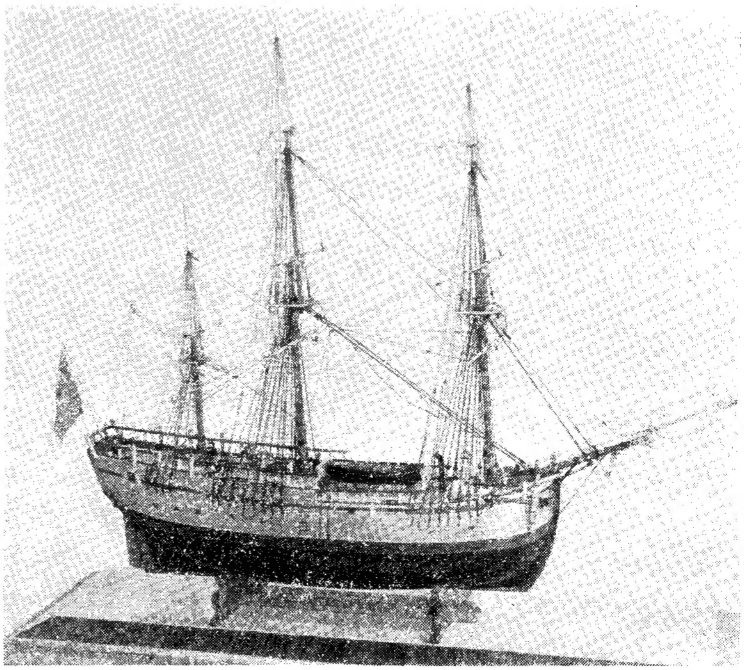
This had the appearance familiar in Oriental pictures, and one would imagine that the detail was authentic, having regard to the source of the model. The sails were slatted, and the roofs of the deckhouses were of woven matting. A four-pronged grapnel or anchor was in the bows, and there were two large oars or sweeps towards the stern.

Beautiful Workmanship

I never cease to be amazed at the patience and skill shown by the



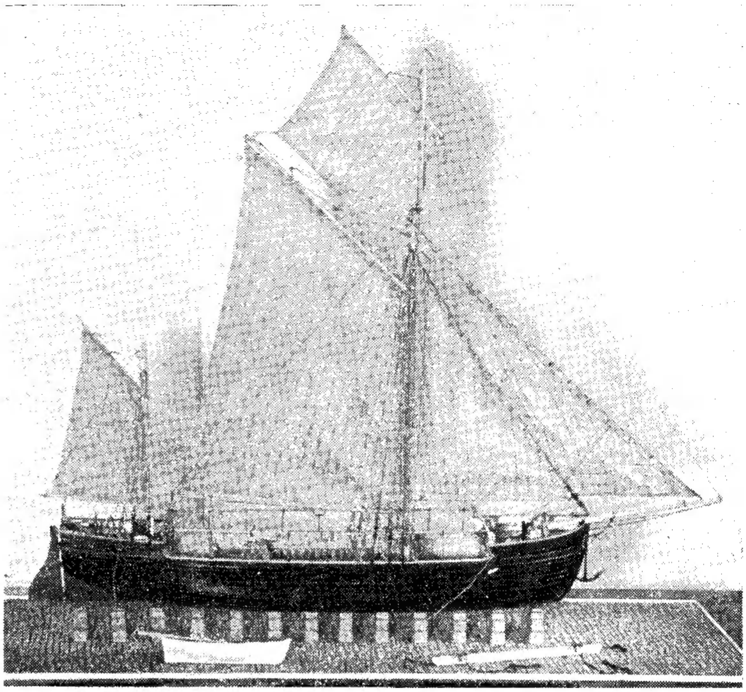
This Chinese junk was one of two native-built models exhibited by N. Lishman



C. J. Clarke's bark "Endeavour" was a wonderful piece of craftsmanship

"top" shipmodellers, and as everyone knows, Birmingham possesses several people who might fairly be so classified. Photographs are reproduced herewith of two models which have won high honours at the London exhibition.

One, by C. J. Clarke, is of the 1/5-in. scale cat-built *Endeavour* Bark of 1768, which won the Maze Cup at last year's show. The hull was built on frames, and the fitting of the planks was exceedingly good. Rigging and masting were superb: these Birmingham S.M.S. lads produce their own cordage on a home-made miniature rope-walk, and very good it looks, too. Other detail noticed on this lovely ship included a small boat (itself full of detail and plank-built), some beautiful gratings, and the built-up steering-wheel.



This model of the Severn trow "Alma," by A. E. Field, is now on indefinite loan to the National Maritime Museum

A Severn Trow

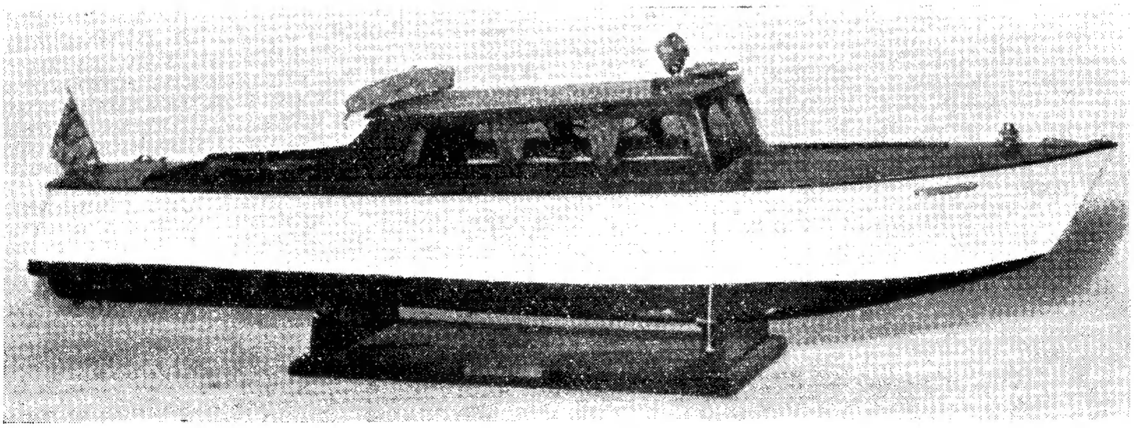
Finally, the ¼-in. scale Severn Trow *Alma*, which won a silver medal at the 1952 MODEL ENGINEER Exhibition, and was built by A. E. Field, also of the Birmingham S.M.S. The prototype was built at Gloucester in 1854, and rebuilt at Saul in 1916. In company with others of the class the vessel was used for transport on the Severn, which was navigable for 155 miles, before the advent of the railway. The masts were in tabernacles, so that low bridges could be passed, and there was a detachable keel (seen near the bows) which could be positioned under the fore-part of the hull and secured there by chains. This was to enable her to go to windward, which she could not do otherwise.

Because of the low free-board, and of the violence of the weather at times in the Severn Estuary, stanchions were affixed to the bulwarks, supporting horizontal poles. Over these, "side-cloths" would be stretched when necessary, to give more protection for the cargo.

Hull Structure

The hull is planked on frames; part of the planking in the model is left off to show the method of construction. Finish and detail are, of course, excellent in every way; I was particularly taken with the tiny block-and-chain tackle which connected the steering-wheel to the tiller.

Much of the builder's information was obtained from Mr. Grahame Farr, who is an authority on the trow. By the time this report appears in print, the model itself will be at Greenwich, too, for it is going there on indefinite loan—a tribute indeed to the builder's accuracy and craftsmanship!



H. Lockley's 1-in. scale cabin-cruiser which was described in the preliminary report of the Birmingham show

Rebuilding a

MACHINE VICE

By "Duplex"

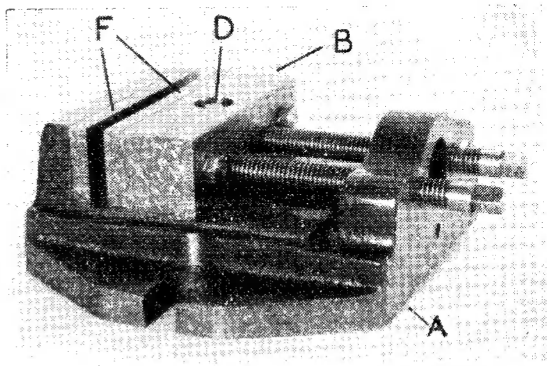


Fig. 1. The finished vice after rebuilding

AN accurate machine vice is almost essential in the workshop, both for holding parts on the table of the drilling machine and for mounting work on the lathe faceplate, saddle, and vertical-slide. The rebuilt vice, illustrated in Fig. 1, was made from a discarded machine vice found on the scrap heap and, as some of the parts were missing and others damaged, it was decided to reconstruct the vice entirely and to alter the original design where this seemed adivsable, in view of the limited workshop resources at the time.

It so happened that this work was undertaken during the war years, and at a time when the large precision lathe used in the workshop had been surrendered for munition making and had not been replaced. This left only a drilling machine and the usual hand tools for carrying out the work.

As manufactured, the moving jaw of the vice was actuated by a single central jackscrew, but owing to the limitations imposed by the lack of equipment, it was decided to fit two vice screws so that, if required, tapered work could be securely held without danger of straining the jaw.

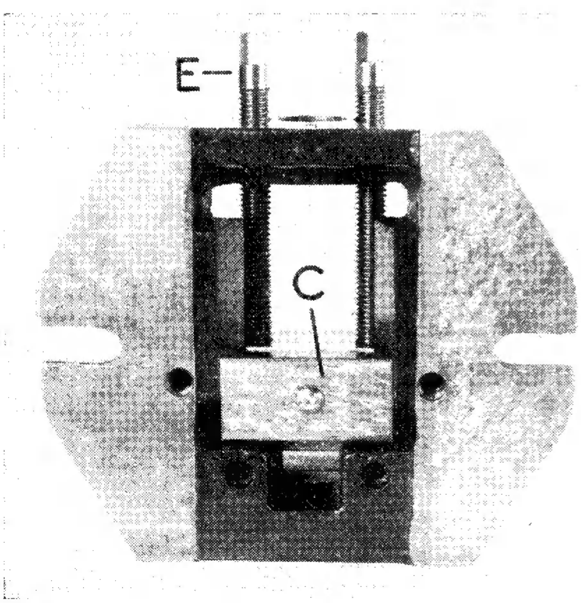
Correcting the Base Casting

The base casting (*A*) was of reasonably robust design and there appeared to be plenty of metal in the essential places; but, from rough handling, the various machined surfaces had become far from flat and out of square with one another.

If the vice is to hold the work accurately, the floor or work surface of the vice must be exactly parallel with the under surface of the base, and the fixed jaw must stand truly square.

When tested on the surface-plate, the base had a marked rock, and the first operation, therefore, was to file and scrape this surface flat in order to form a datum surface from which to work.

The next step was to make the vice floor parallel with the under surface of the base. As a preliminary test, the vice was again placed on the surface-plate, and the dial test indicator, mounted on the



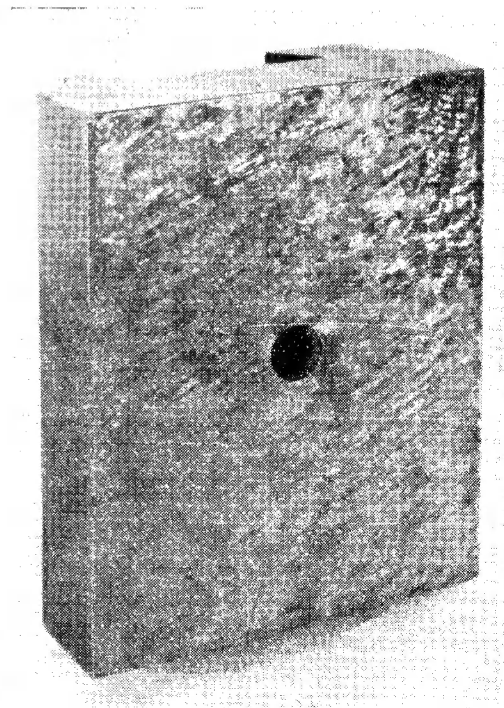


Fig. 2. The underside of the vice, showing the method of clamping the moving jaw

Right—Fig. 3. The small surface plate made for truing the vice work-face

pillar of the surface gauge, was moved over the vice floor in all directions to determine where any high spots needed levelling. In order to true this surface after filing, the small surface-plate shown in Fig. 3 was made from an iron casting by filing and scraping its under surface flat and the surface of one side flat and square. This may seem a rather tedious and roundabout way of going to work, but it so happened that time was no object, and no suitable machine tools were then available for correcting the vice in the ordinary way. Anyhow, this small surface-plate eventually enabled the work surface and the standing jaw of the vice to be scraped flat and square.

As the bolting lugs on the base had not been machined, the casting was clamped to the table of the drilling machine for spot-facing the bolting faces at the right distance apart to correspond with the T-slots of the vertical milling slide.

The Moving Vice Jaw (B)

The movable jaw was made from a short length of 1 in. square mild-steel, filed square and true on all faces.

This jaw is fitted on its under side with a plate (*C*) that bears on the slide-ways machined under the vice floor, thus forming a V-slide for guiding and holding down the moving jaw.

After these slide-ways had been scraped flat, the two ends of the keep-plate were filed to correspond and bear evenly.

The square-headed screw (*D*) for clamping the jaw was then made and its head was filed to fit a square socket-key selected from the spanner box. As will be seen, the moving jaw is counter-drilled to allow the head of the clamp-screw to lie just below the surface and, at the same time, this recess is made large enough for the spanner to enter and engage the screw head.

Fitting the Vice Screws

As only hand tools were available for the job, the jack screws were made from $\frac{3}{8}$ in. dia. mild-steel rod, threaded $\frac{3}{8}$ in. B.S.F. with a die while held in the bench vice.

The squared ends of the screws, 9/32 in. across the flats, were formed by filing in the vice. A steel washer was slipped over the end of the screw to bear against the face of the vice jaws, both to protect them from damage and to maintain the flats at a uniform length. Forming the square head is easily done with the aid of a micrometer: one flat is

(*Continued on page* 765)

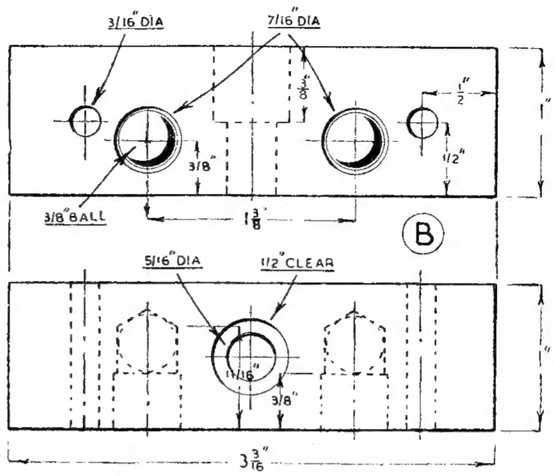


Fig. 4. Showing the dimensions of the new moving jaw

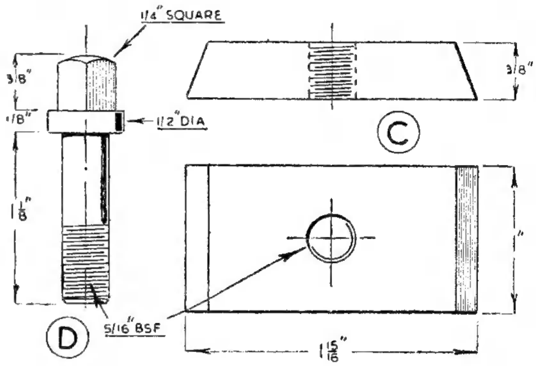


Fig. 5. The jaw clamp-plate "C" and its clamp-screw "D"

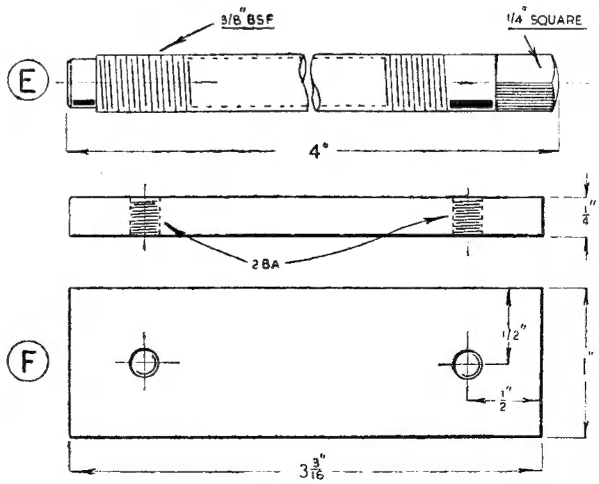


Fig. 6. The vice screws "E," and the two jaw plates "F"

L.B.S.C.'s "Britannia" in 3½ in. Gauge

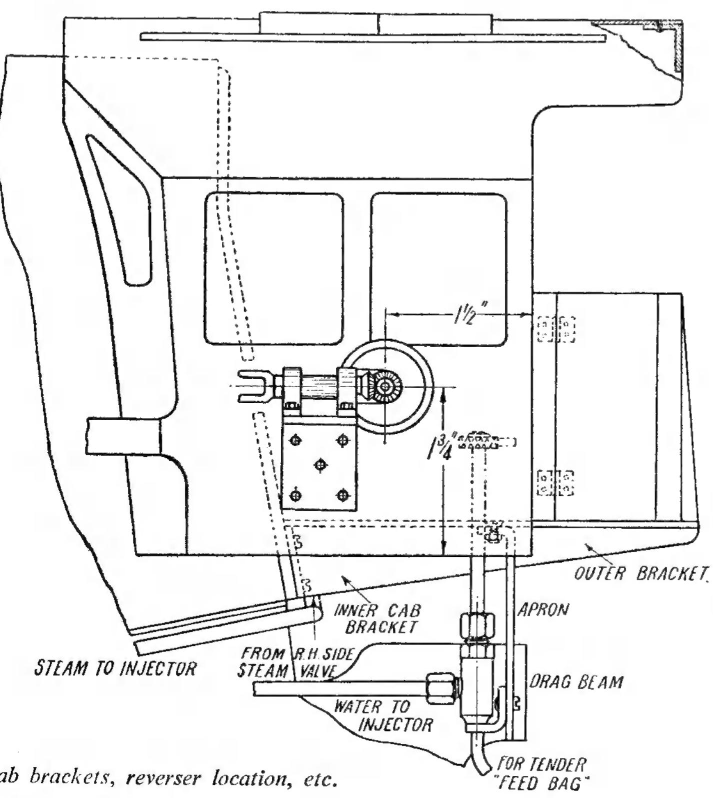
• HOW TO ERECT THE CAB

AS the cab and running-boards on this engine are erected in a different way from anything I have hitherto described, maybe a word or two of explanation may not come amiss. On the big engines, the whole issue is built up from steel plate, and most of the joints are made by riveted angles—though there is no imposing array of pimples!—and the cab is supported on long triangular-shaped brackets attached to the boiler backhead. Between the cab deck and the drag-beam, there is an apron, or baffle-plate, one function of which was intended to prevent a rush of air striking the front of the tender, sweeping up between the back edge of the cab footplate and the tender coal gate, and not only giving the enginemen extra fresh-air treatment, but at the same time turning them into passable imitations of nigger-minstrels! This didn't come up to expectations at first, and the cabs proved draughty and dirty; and an improvement has now been made. There would not have been any trouble, if the sides of the plate had been sloped back, something like the cab front, to deflect the rush of air out at the sides. At each side of the cab, behind the driver's and fireman's seats, a shielding plate is fixed, to prevent back draughts. There is also another plate, right across the footplate at the back of the " balcony " cut away at the centre, to allow the fireman free access to the shovelling plate and coal gate.

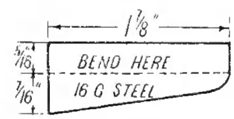
On our little engine, I have been able to simplify matters quite a bit, whilst retaining the characteristics of big sister. The edges of the cab deck or footplate, and the apron, can be bent over, dispensing with fixing angles; and the brackets carrying the cab, can be made in one piece, also by the " bendification " process. This not only saves time, but makes a strong job. An auxiliary short bracket is fixed at each side, close to the edge of the " balcony," and this also provides the bottom support for the handrail. The joint between the cab side, and the roof, is made just above the cab windows. I have shown a roof-supporting brace at the top, as there is one on the big engine; but it isn't really necessary, and may be left off. You need all the available open space at the back of the cab, to make it easier to get at the " handles " and the firehole.

Cab Supporting Brackets

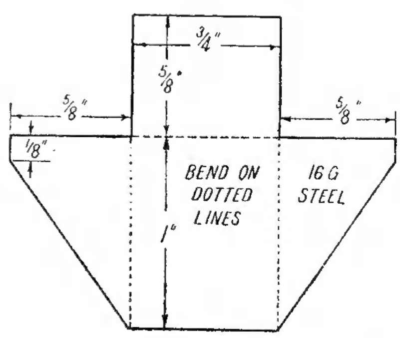
For the main bracket, cut out a piece of 16-gauge soft sheet steel, to the dimensions given, and bend on the dotted lines. If the angle has been set out correctly, the upper edges of the bracket should be horizontal when the front part is butting up against the boiler backhead. Drill seven No. 34 holes in



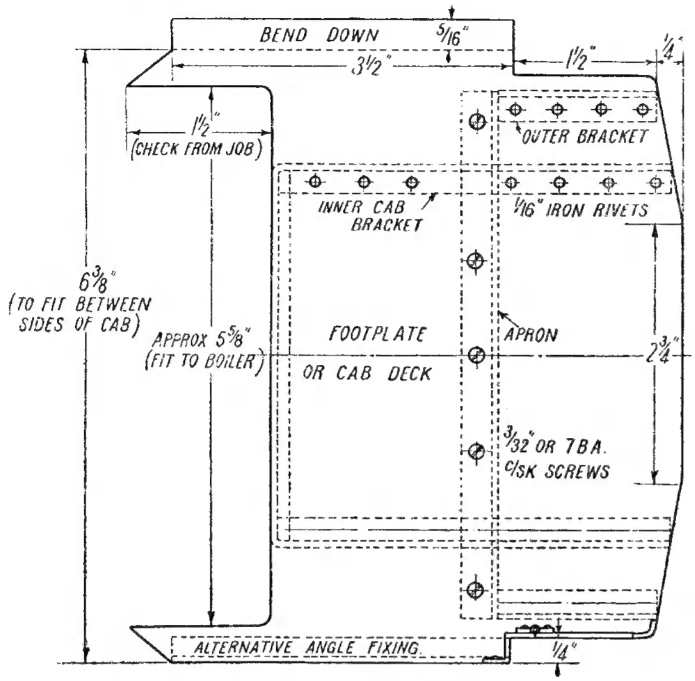
Cab brackets, reverser location, etc.



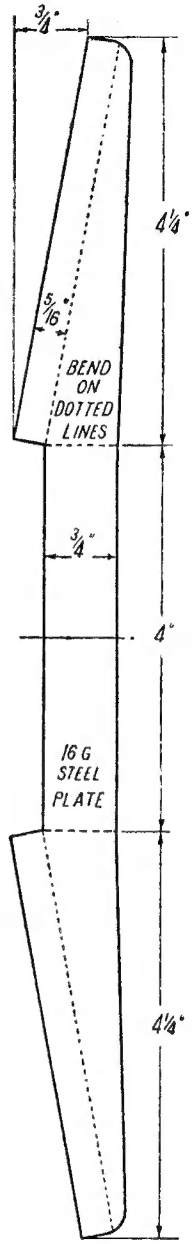
Outer cab bracket



Reversing gear bracket " in the flat "



Footplate or cab deck



How to cut out main cab bracket

the connecting part, as indicated by the dotted screwheads in the back view; then clamp temporarily in position against backhead, and using the holes as guides, drill and tap the backhead for 6-B.A. screws (No. 44 drill). There is no objection whatever to home-made bronze or gunmetal screws in the backhead, any more than the screwed shanks of fittings; clean threads, and a taste of plumbers' jointing on them, will prevent any leakage. Don't attach the bracket permanently yet, as the footplate, cab, and other items have to be fixed to it.

Footplate or Cab Deck

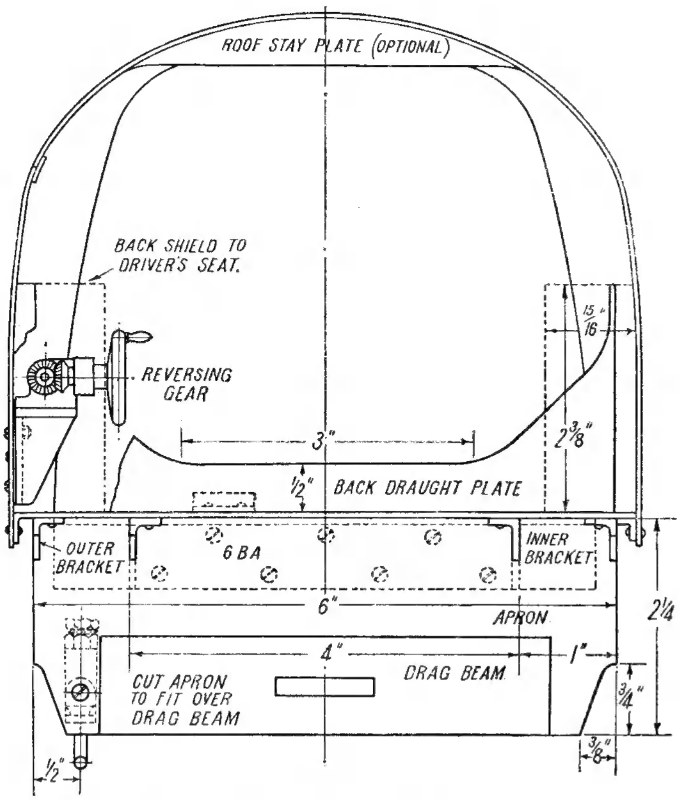
The next item is the footplate. Cut it to the dimensions shown, from 16-gauge soft sheet steel. Note that the edges may be either extended and bent over for riveting to the cab sides, or separate pieces of angle may be riveted on. Fit the opening to the boiler, so that the footplate fits closely against the backhead, and the sides of the wrapper. Nick as needed, with a rat-tail file, to clear pipes. Place it in position on top of the brackets, clamp temporarily, and rivet the bent-over angles on top of the brackets, to the underside of the footplate, as shown in back view. Use $\frac{1}{16}$-in. iron rivets.

Apron or Wind Deflector

This made from a piece of 16- or 18-gauge steel plate, 6 in. wide and $2\frac{5}{8}$ in. deep. Bend over $\frac{3}{8}$ in. of one long side, for attachment to the underside of footplate. At the bottom, cut away a piece $4\frac{5}{8}$ in. × 1 in. to clear the drag beam; then cut away the corners as shown. Put this merchant in the position shown in the side view, and drill five No. 41 holes through footplate and flange, in the approximate position indicated by "banner signals" in the plan drawing, countersinking them on the footplate. Put a couple of screws in temporarily, to hold the footplate in place whilst the rest of the cab is being erected. Cut out and bend the two outer short brackets, and rivet them to the underside of the footplate, level with the edges of the apron; see end and plan views.

Cab Assembly

If you haven't finished cutting out the cab sides and front, illustrated three weeks ago, do that job now; no detailed instructions should be needed. Rivet a runner at each side of the opening in the cab roof, and bend two pieces of sheet steel to the radius of the roof, fitting them to the runners so that one can slide forward, and the other backward. Rivet a similar runner to the top and bottom of the cab window openings, so that a piece of mica or cellophane can be slid in, to form the "glazing." The front windows don't need to open—the enginemen might literally "lose their heads" when the engine is running fast !—so just cut out a brass frame, same shape as the opening, but about $\frac{1}{8}$ in. bigger all



Back of cab, showing brackets, apron and shield plates

around. Rivet this over the opening on the inside of the cab front, with a piece of thin mica between. Bits of domestic pins make fine rivets for jobs like this; alternatively, 12-B.A. screws may be used. Rivet a butt strip of 16-gauge metal about $\frac{3}{8}$ in. wide, along the top edge of each cab side; when the whole issue is finally erected, the roof can be attached to this by $\frac{1}{16}$-in. countersunk screws, or roundheads if the builder is pimple-conscious.

The sides and front of the cab are joined by pieces of strip metal about $\frac{1}{2}$ in. wide, bent to an obtuse angle, to fit nicely against the edges; rivet up with $\frac{1}{16}$-in. iron rivets, either countersunk or pimple-headed as preferred. The cab thus far assembled, can then be dropped over the boiler and adjusted for position; the sides should project below the footplate angles at either side, as shown in the end view. Clamp the sides to the flanges, and rivet with $\frac{1}{16}$-in. iron rivets. Note: the pimples should be spaced fairly wide apart; look at any picture of the full-sized locomotives. If I may be forgiven for giving our pimple-loving brothers a friendly poke in the ribs, very close riveting defeats its own objective. You have no trouble in tearing up a closely-perforated sheet of postage stamps; but if the perforations were widely spaced, they would want some tearing. Well, same applies to holes in a sheet of metal; I have demonstrated several times, *that a close-riveted joint can actually be torn apart*, but with widely-spaced rivets, it is untearable. 'Nuff sed !

Balcony

As the " balcony " is set in $\frac{1}{4}$ in. from the cab sides, the space may be closed in by a piece of 18-gauge sheet metal bent to a double angle, as shown in the plan of footplate. This is riveted to the inside of the cab sheet. By the way, some beginners have slated me for not giving separate detail drawings of all these oddments, same as I do with the working parts. Bless your hearts and souls—if I did *that*, I'd need the whole of every issue in which this serial appears ! There are hundreds of sheets of drawings made for the big engines; but there are hundreds of draughtsmen to make them, in umpteen drawing offices; some different proposition to one solitary drawing-board, and a self-taught pencil-juggler to operate on it. I give full drawings of *parts that are vital*, such as valve gears; but I trust the commonsense of followers of these notes, to be able to make, for example, a metal door, and put a couple of hinges on it—and similar jobs—without the necessity of giving plans, elevations, cross-sections, and what-haven't-you.

The draught plate at the back of the balcony is made from a piece of 18- or 20-gauge steel, $2\frac{3}{8}$ in. wide, bent over at each end as shown in the elevation. The centre part is cut away as shown in the back view; and the plate is bent slightly, to follow the contour of the back of the footplate. It is attached to the footplate by riveted angles; commercial angle can be used, but narrow angle, say about $\frac{3}{16}$ in. wide, can easily be made in the bench vice from odd strips of the self-material. This not only looks neater, but nae bawbees are needed, vot you tink, eh? If the enginemen's draught shields are fitted (I'm fitting neither them, nor the seats, on my own engine, as I won't be riding in the cab) they can be cut from 18- or 20-gauge plate, to the sizes shown, and riveted to the door supports at the back of the cab. A beading of 3/32-in. half-round wire can be soldered around the edges of the lot, same as I specify for tender beadings. If the steel is scraped or filed bright, the solder will " stick " all right.

The doors are just pieces of 18- or 20-gauge steel, cut to fit closely in the openings, and the hinges are made from thin sheet brass, riveted on with bits of domestic pins; see plan view.

If the apron is detached, the whole cab assembly can be put into place, and attached with screws put through the bracket into the backhead, as shown; don't forget to smear the threads with plumbers' jointing. The apron can then be replaced, and fixed by the five screws shown, nutted under the apron flange. If desired, an extra bit of angle can be used to fix it to the top of the drag beam; but it should " stay put " without, as it stands no stress, and the metal is stiff enough to support the slight weight of the injector water valve and the bypass valve at each side.

Cab Reverser

I'm going to say right here, that if anybody asserts that a " scale " copy of the full-sized reverser can be made as a *satisfactory* (very

important, that) working proposition in $3\frac{1}{2}$-in. gauge, he is just talking through his hat. I have the full-size drawings of the full-sized gadget, thanks to Mr. Riddles; and for curiosity, I " scaled " it down, just to see the actual size of the working parts. The bevel gears would do all right for a clock, but wouldn't last the proverbial five minutes in actual service on a little *Britannia*; and as the flanges of the casing would be less than $\frac{1}{16}$ in. wide, the casing would have to be put together with watch screws. This might be O.K. for a glass-case job, but decidedly N.B.G. for our requirements ! I therefore, got out a simpler, but much stronger job for our engine, able to stand up to hard usage, but very little larger, in proportion, and with the characteristics of the original design.

The first requirement will be a pair of $\frac{3}{8}$-in. bevel wheels. This is a regular size, and should be easily obtainable; but any size within reason can be used, if the bearings are spaced to suit. Both spindles are made from $\frac{1}{8}$-in. silver-steel; main spindle, overall length $1\frac{3}{16}$ in. wheel spindle, $\frac{11}{16}$ in. Turn down $\frac{1}{8}$ in. of the wheel spindle to 5/64 in. diameter, and screw it 9 B.A.; file the next $\frac{1}{8}$ in. square. Turn the ends of both spindles to a tight fit in the bevel-wheel bosses, the length of which should be reduced, so that the hole through them is not more than $\frac{3}{16}$ in. long. Squeeze the wheels on, and silver-solder them.

Reverser Bearings

The main spindle bearing is a $\frac{3}{4}$ in. length of $\frac{1}{4}$-in. bronze rod, drilled No. 34 and reamed $\frac{1}{8}$ in. Square off both ends in the lathe. The wheel spindle bearing is a $\frac{5}{16}$ in. length of $\frac{1}{4}$-in. rod served likewise. The support for the front end of the spindle bearing, is cut from $\frac{3}{16}$-in. brass or steel to the shape shown, and drilled and reamed $\frac{1}{4}$ in. to fit tightly on bearing. The back one is rounded off at one side, but is flat on the other, as the wheel spindle support is fixed to it; see plan and end views. The support for the wheel spindle bearing is a piece of $\frac{3}{16}$ in. $\times$ $\frac{3}{8}$-in. brass or steel, $\frac{11}{16}$ in. full length, rounded off at one end, which is drilled and reamed for the bearing, same as the other one. Drill two No. 41 holes in the other end, for the screws holding the parts together. Press the supports on to the bearings, making sure the bases are parallel, and silver-solder them.

Put the spindles through the bearing, and temporarily place the two parts in position, holding them with a toolmakers' cramp, to see if the gear wheels mesh properly. If they don't, simply adjust the two parts until they do; then run the No. 41 drill through the holes in the wheel bearing support, making countersinks on the lug. Open out with No. 48 drill, tap 3/32 in. or 7 B.A., and put screws in, as shown in the plan section.

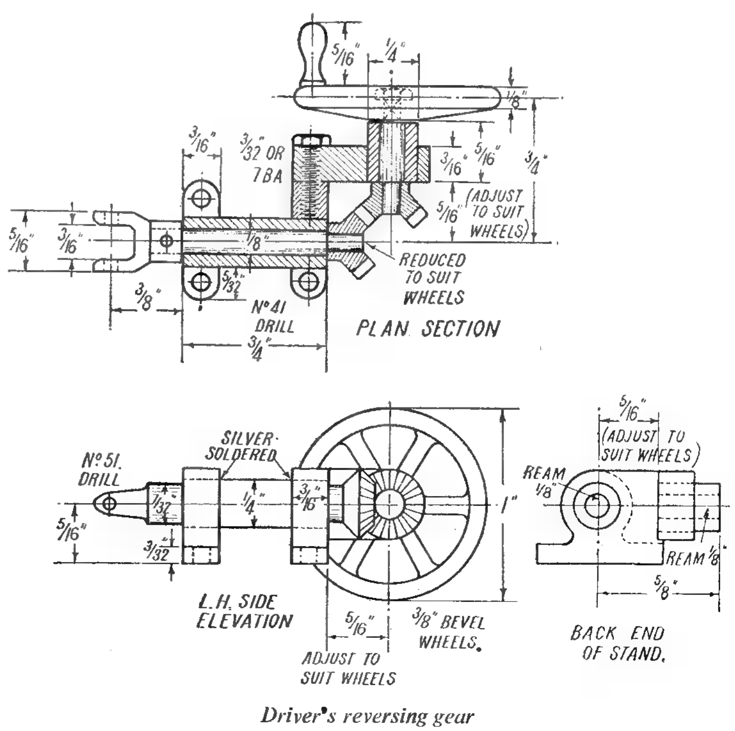
Wheel, and Part of Universal Joint

The wheel can be turned from a piece of 1-in. round rod, any kind of metal you fancy; dural makes nice wheels. Chuck in three-jaw, and turn to the shape shown; centre, and drill 3/32 in. Part off by running in the parting-tool at an angle, to give the wheel a coned back. Drill six $\frac{3}{16}$-in. holes in the web, and file to the shape of spokes; file or punch the centre hole square. The handle or grip is turned from $\frac{1}{8}$-in. rod, leaving a pip on the end; drill a hole in the rim to suit, press in the pip, and rivet over. Then fit the wheel to the squared part of the spindle, securing by a 9-B.A. nut. This way of fitting, has been described umpteen times, in full detail, for fitting quadrant-type regulator handles. The wheel should turn freely, with just a weeny bit of endplay on the spindle.

The fork forming half of the universal joint, is made from $\frac{5}{16}$ in. square steel. Chuck in four-jaw, face the end, centre, and drill No. 32 for about $\frac{5}{16}$ in. depth. Turn down 5/32 in. length, to a bare $\frac{1}{4}$ in. diameter. Part off at a bare $\frac{1}{2}$ in. from the end, then file or mill to the shape shown. The No. 51 hole for the pins, should be drilled right through the piece before any filing or milling is done; this ensures the holes being exactly opposite. Press the fork on the end of the spindle far enough to avoid endplay, yet leaving the spindle quite free to turn; pin the boss to the spindle with a bit of steel wire, which should be smaller than $\frac{1}{16}$ in. to avoid making too big a hole through the spindle and weakening it. If you have any broken drills below size 55, the shanks make excellent pins. Use a drill one size smaller, for the hole, and you get just the right squeeze fit.

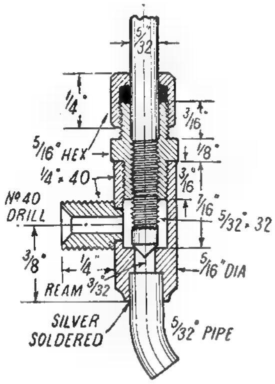
Reverser Bracket, and How to Erect

The bracket is cut from 16-gauge sheet steel, to the shape and dimensions shown, and bent on the dotted lines; the corners may be brazed. The reverser is attached to the top of the bracket, by three 3/32-in. bolts and a set-screw. The latter enters a tapped hole in the underside of the stand, below the wheel bearing support, as a bolt cannot be fitted there. The whole



Driver's reversing gear

bag of tricks is then attached to the inside of the cab, by five 3/32-in. or 7-B.A. round-head screws, nutted inside the bracket. Mark off the position of the bracket on the *outside* of the cab, then drill the holes in the cab side, using No. 41 drill, and filing off any burrs. Put the assembly in place inside the cab, temporarily clamping it in position; run the drill through the holes in the cab side, right through the bracket, and put the screws in. The " cardan shaft " connecting the reverser to the screw on the valve-gear, will be fitted later, together with the rest of the universal joints.



Injector water valve

Note : Anybody who doesn't want the trouble of fitting bevel gears, can leave them out, and just fit a smaller wheel, or a plain cross handle, direct on the end of the main spindle. The reverser will then be operated like turning an organ instead of a mangle !

Injector Water Valve

This is fitted on the engine, instead of the tender, as is usual on small locomotives. A similar valve is fitted on the opposite side, to act as bypass valve, so make two of them while you are on the job. Part off a piece of $\frac{5}{16}$ in. round rod a full $\frac{3}{4}$ in. long. Centre and drill right through with No. 43 drill; open out and bottom to $\frac{7}{16}$ in. depth wtih 7/32-in. drill and D-bit, and tap $\frac{1}{4}$ in. × 40. Reverse in chuck, open out the end to a full $\frac{1}{8}$ in. depth with No. 23 drill, ream the remains of the hole with a 3/32-in. parallel reamer, and bevel the edge as shown. Drill a $\frac{3}{16}$-in. hole in the side, $\frac{3}{8}$ in. from bottom, and fit a $\frac{1}{4}$ in. × 40 union screw in it. Fit a $\frac{5}{8}$-in. length of 5/32-in. copper pipe in the counterbore. Fit a little bracket made from $\frac{1}{16}$-in. brass sheet, on the pipe, close to the valve body (see assembly drawing), and silver-solder the joints at one heat.

Chuck a bit of $\frac{5}{16}$-in. hexagon brass rod in three-jaw; face, centre, drill down a full $\frac{1}{2}$ in. with No. 30 drill, open out to $\frac{1}{4}$ in. depth with No. 21 drill, turn down $\frac{3}{16}$ in. of the outside to $\frac{1}{4}$ in. diameter, and screw $\frac{1}{4}$ in. × 40. Part off at $\frac{1}{2}$ in. from the end, reverse in chuck, repeat turning down and screwing operation, and run a 5/32-in. × 32 tap through the remains of the No. 30 hole. Make a gland nut to suit, from $\frac{5}{16}$-in. hexagon brass rod.

The valve pin is a $2\frac{3}{4}$-in. length of 5/32-in. rustless steel or bronze rod. Turn a cone point on the lower end, and screw $\frac{1}{2}$ in. of it 5/32 in. × 32, above the point. Assemble as shown, packing the gland either with graphited yarn, or a bit of unravelled hydraulic pump packing. Drill a $\frac{3}{16}$-in. hole in the footplate, to allow the valve pin to project up into the cab—you can get the exact location of this by " offering up " the valve in approximate position—then attach the bracket to the front of the apron, as shown in the side view of the cab, by a 3/32-in. screw. The second valve is attached to the opposite side, in precisely the same way. The upper ends of the valve pins can be furnished with cross handles, or knurled wheels, just as you wish; the full-sized engines have wheels, with a pin in the rim, to prevent greasy hands slipping on the wheel when operating the valve. The wheels are fitted in the same way as those on the boiler fittings.

Next jobs will be to erect the running-boards, and do a bit of plumbing, as the pipes on the big engines are located under the running-boards as far as possible.

REBUILDING A MACHINE VICE

(*Continued from page* 760)

first filed down for 3/64 in. and, after the rod has been turned through 180 deg., the opposite side is reduced by a like amount ; the two remaining flats are formed in the same way and checked with a try-square.

It should, however, be pointed out that, as soon as a lathe again became available, the vice screws were shouldered as shown in the drawing and, at the same time, their ends were countersunk with a centre drill to form a seating for the thrust balls.

After the end of the base casting has been filed flat and square, the centres for the two vice screws are marked-out. For drilling the tapping-size holes, the casting is best bolted to an angle plate resting on the table of the drilling machine.

After these holes have been drilled, the movable jaw is closed up and securely clamped in place, so that it can be spot-drilled in the working position. When tapping the casting, great care must be taken to keep the tap exactly square with the end surface. The holes in the movable jaw to receive the ends of the vice screws are drilled $\frac{3}{8}$ in. dia. to house a $\frac{3}{8}$ in. dia. bearing ball for taking the thrust, and the mouths of these holes are afterwards opened out to allow the movable jaw to set obliquely when holding tapered work.

Fitting the Jaw Plates (F)

The two jaw plates are made of mild-steel and can either be case-hardened or left soft according to personal preference, but soft jaws have been found quite satisfactory, provided that they are kept free from the drilling chips that are liable to become embedded in the gripping surfaces ; moreover, the pieces of card used to protect finished work, also save the jaws from damage. After the two jaw plates have been filed true, they are placed in position and the vice fully tightened. With the vice again bolted to an angle plate resting on the drilling machine table, the holes for the fixing-screws are drilled right through the fixed jaw, the two jaw plates, and the moving jaw. The jaw plates are then removed and the tapping-size holes threaded.

After reclamping the moving jaw in position, clearance holes for the screws are formed in both jaws by enlarging the tapping-size holes already drilled. This enables the jaw plates to be secured by putting in 2-B.A. hexagon-headed screws from the outer side of both jaws. This completes the construction and, if the work has been properly carried out, the vice can be relied on to hold work-pieces in exact alignment either on the table of the drilling machine or on any of the lathe fittings.

RUST PREVENTION

By A. S. J. Painter

THE interesting and authoritative comments which have appeared in THE MODEL ENGINEER correspondence columns on the subject of rust prevention and corrosion inhibition suggest that the problem is being widely met with in model engineering circles, and this article will endeavour to answer some of the queries which have arisen from the correspondence.

One correspondent asked : " What is rust ? "—briefly, rust is the result of oxidation of ferrous metals due to the combined action of water, oxygen and carbon dioxide. It may be considered as equivalent to the slow burning of the metal in air, the process eating deeper and deeper into the solid metal until eventually it disintegrates into a heap of ashes or red rust.

The total amount of destruction caused annually by rust is immeasurable. It has been estimated that as an annual defence measure the world spends some £500,000,000, and Great Britain alone, £40,000,000. It is thus obvious that the problem is a big one, and indeed it has engaged the attention of scientists all over the world ever since the Industrial Revolution.

Perhaps the most significant contribution to scientific thought on the question of rust inhibition is the series of rust inhibiting oil additives which were developed under the stress of war-time, when rust was properly recognised as a grave enemy, whose depredations could, and indeed did, result in almost as much loss of equipment as was suffered as a result of direct enemy action.

It is important to remember that straight mineral or other oils will not in themselves prevent rust. There must be an incorporation of a specific additive for this purpose, but it is a fact that today there does exist a series of really first-class oil-borne additives, not all of which are available in this country, but which will in fact completely and absolutely inhibit rust and corrosion of all kinds.

Until very recently, most of these rust inhibitors were sticky substances which, once applied, formed a rust-resistant coating over the metal. These were quite effective, but the disadvantages were: (*a*) difficulty of application and removal; (*b*) unsightly appearance; (*c*) danger of incomplete removal causing drag on bearings, and in particular, abrasion of ball-bearings by the adherence of abrasive dust and dirt.

Other methods incorporate the use of paints, shellacs or varnishes " taping " or wrapping in adhesive tape to exclude the " attacking " elements. Because of the manifold disadvantages of these methods a new approach was made during the last war to produce rust inhibitors, easily applied and easily removed, transparent, and of a character not calculated to mar even temporarily the appearance of the item, and the new oil-borne inhibitors are the result.

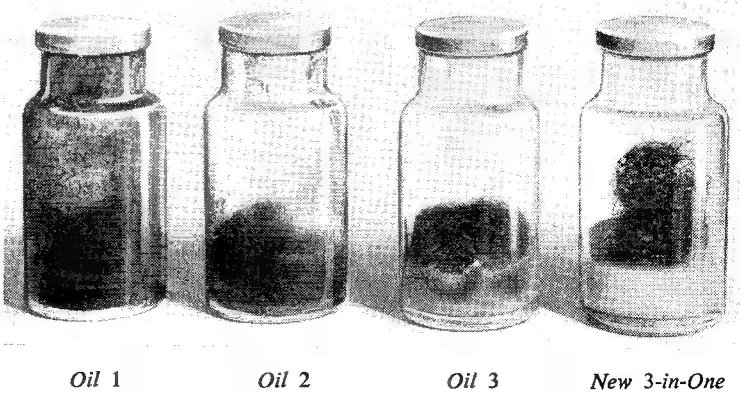
The modern, highly efficient rust inhibitor consists of certain chemical compounds containing a hydrocarbon attached to a " polar " group of atoms. The polar groups have an external electric field which is strongly attracted to the electrical field of the metal, causing them to attach themselves to the surface of the latter as an adherent, moisture-impervious, multi-molecular film. The orientation of the polar organic additive at the oil/metal interface establishes a barrier against the entry of rusting agents—oxygen and water.

At the same time, the product must act as an emulsifier, enabling the oil to absorb any particles of moisture present on the metal surface at the time of the application by surrounding each droplet of water with a film of oil, and holding it in suspension in the body of the oil.

Messrs. E. R. Howard Ltd., of Stowmarket, manufactures of " 3-IN-ONE " oil, claim that the rust inhibiting additive contained in their oil is the most efficient available on the British market, whilst in combination with its well-known lubricating and penetrative qualities, it appears that this product holds the perfect key to the problem of rust prevention and inhibition in the workshop, in the factory and, indeed, anywhere where rust and corrosion are a menace.

Straight mineral or other oils will not prevent rust—as is clearly indicated in the photographs. These show a series of " balls " of steel wool—all of the same calibre and all subjected to scientific cleansing and drying as a preliminary to the test. When it was certain that every particle of foreign matter or moisture had been removed, the wool was dipped into the oil to be tested and allowed to drain. Three well-known contemporary brands of mineral oil were tested at the same time as " 3-IN-ONE."

Each ball was then placed in a jar in which was poured about 1 in. of water. The jars were placed in an oven at a temperature of 180 deg. F. with caps lightly unscrewed, thus creating an atmosphere of high humidity—calculated to cause metals to rust very quickly. The result showed that Oil No. 1 permitted rust within three hours of the test. Oil No. 2 permitted rust within 11 hours. Oil No. 3—an oil offered as a rust inhibitor, and actually containing a special ingredient for this purpose—permitted rust in 22 hours. Oil No. 4 is " 3-IN-ONE " oil. This jar, when photographed, had then been on



Oil 1 *Oil* 2 *Oil* 3 *New* 3-*in*-*One*

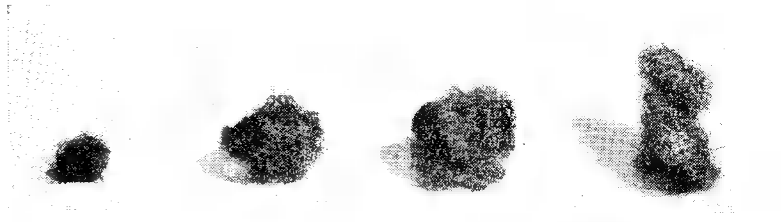
test for six months. It showed no sign of rust!

The metal in both No. 1 and No. 2 jars has disintegrated; that in No. 3 is in process of disintegrating. But the metal in jar No. 4 remains bright and clear; the metal is firm and has retained all its characteristics. It will be noted that the water in No. 4 jar has a "milky" appearance. This is due to the emulsification of the water in the oil and since, as we have shown, an efficient rust inhibitor must emulsify each droplet of moisture on any metal to be treated, this is a further proof of the efficacy of the product.

The second photograph shows the "balls" of steel wool on their removal from the jars 12 months after the beginning of the test. *Remember all the balls began as the same size and shape.*

Sample No. 1 has completely collapsed and is a mass of rusty powder.

Sample No. 2 is similarly affected, resilence has gone, and the metal has rusted away. Sample No. 3 has "fallen in" on itself and is incapable of supporting its own weight. Sample No. 4 is still bright, and retains its resilience and strength after 12 months of the most rigorous testing. The ease of application would seem to be another important attribute of the product and the method has the attraction of extreme simplicity.



Oil 1 *Oil* 2 *Oil* 3 *New* 3-*in-One*

"3-IN-ONE" oil may be applied generously with a soft brush to the part to be protected and excess removed by drainage. For large-scale application the method is to spray the part and allow to drain. The product is highly penetrative, but reasonable care must be taken to ensure that the film of oil is complete. Small parts should be immersed and allowed to drain.

"3-IN-ONE" oil is a pale fluid of low viscosity; it will not stain or damage, is non-corrosive, and free flowing. The product has a positive cleaning and polishing action and will actually improve all known "finishes." For small-scale application no special apparatus is necessary, but for large-scale operation the oil may be used in any spray-device such as is in common use for painting or for insecticides, etc.

Examination of the whole problem would suggest that the use of "3-IN-ONE" oil would completely and absolutely answer the problem of rust prevention and corrosion inhibition in the workshop, however large or, however small. The manufacturers, E. R. Howard Limited, have a leaflet entitled "Rust Inhibition and Protection in Industry," and we are advised that copies of these are available free, on application to the makers.

A Ballade of the Steamroller

The following "ballade" is reprinted, by kind permission, from a recent issue of the "Observer."

ODDLY ENOUGH

By Paul Jennings

SIGH sadly, O steam, for a piece of machinery
Fast disappearing from all urban scenery;
Soon all County Councils and U.D.C.s'll
Abandon the steamroller, take up the diesel.
Just as green lamp-posts no longer light darkness,
But gaunt candelabra of concrete starkness,
So may we see Time take further revenge in
The desuetude of this lovable engine.
Already it looks a bit palaeolithic
Like the early steam carriage of Robert Trevithick.
Alas, let us weep for this elephant kettle,
This megalosaurus of burnished metal
With splendid funnel and green-striped boiler,
Dreamily steered by an elderly toiler.

Steam, so Victorian, like Carlyle or Tennyson,
Unlike most inventions, was always a benison
(Nobody ever invented steam bombers);
A steamroller's beauty accords with St. Thomas,
For *visum*, it *placet*—a seem thing, it pleases,
As surely as peacocks, or girls on trapezes.
Those rods and those pistons—what pleasure to see 'em,
The whole thing's a travelling Science Museum;
Here Da Vinci might see, brought to working perfection,
His sketch-book ideas from the Windsor Collection
And say, "A divine contradiction thou showest;
Thy flywheel goes quickest when road speed is slowest."

Purposeful, puffing and peripatetic,
The steamroller's nevertheless sympathetic;
The word for this engine, I think, is *avuncular*—
It never dwarfs man, making man feel homuncular;
It walks up and down like a pipe-smoking gardener,
Somehow it's more than a mere mobile hardener.
Come, let us savour its sub-soul, or *mana*,
Let's gather sweet garlands of steamrolliana
Before this creation of Foden or Ransome
Is dead as the dodo, defunct as the hansom.

No Borough Council will ever give ear to
The plea that a road job's an open-air theatre
In which no mere diesel could play the theme role as
For years it's been played by our genial steamrollers;
But, best of all proofs that internal ignition
Is dreary, unloved, lacking steam's ebullition—
No diesel has drama, or fire in its belly,
No diesel is christened *Britannia* or *Nellie*.

A SIX-CYLINDER P

WHILE by no means the writer's first attempt at a petrol engine design, this six-cylinder is a first attempt at a multi-cylinder job. The first stirrings of a desire to get away from the vibration and staccato exhaust from a single cylinder began about seven years ago, and sketches of a four-cylinder o.h.v. engine began to appear on odd bits of paper round the drawing room and get mixed up with the daily paper. The problem of engine balance soon loomed up on the horizon and visits to the local library produced various ideas on engine design.

The perusal of the writings of the experts soon showed that four cylinders would not be the choice of a designer with a hand unhampered by the worries of cost and complication. Six cylinders were the obvious minimum for an engine in which the primary and secondary forces and couples were in balance, and as good balance was one of the main objects in the design, the number of cylinders grew from four to six.

Magneto Design

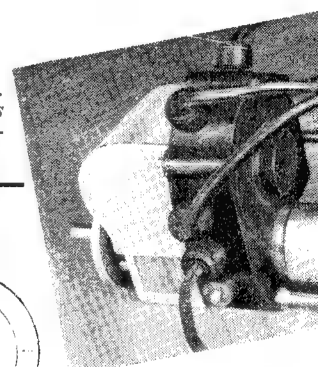
At about this time, the writer was completing a series of experiments with small magnetos which had resulted in a very successful design, proving itself on a 15 c.c. racing engine. With a little trimming and modification, it appeared that this could be adapted with every chance of success to the proposed six-cylinder engine.

As the magneto was of the two-pole rotary magnet variety, the magnet had to be geared up $1\frac{1}{2}$ to 1 in order to obtain three sparks for each revolution of the crankshaft, and the distributor run at half engine speed. These ratios all fit in very nicely to produce a design which would look very nearly in proportion to the rest of the engine from the point of view of scale appearance. The magnet would be running faster than the crankshaft, and would ensure a good spark at starting, while the large gear required for driving the half engine speed shaft for the distributor, if made of bakelite, could be used as the distributor arm itself.

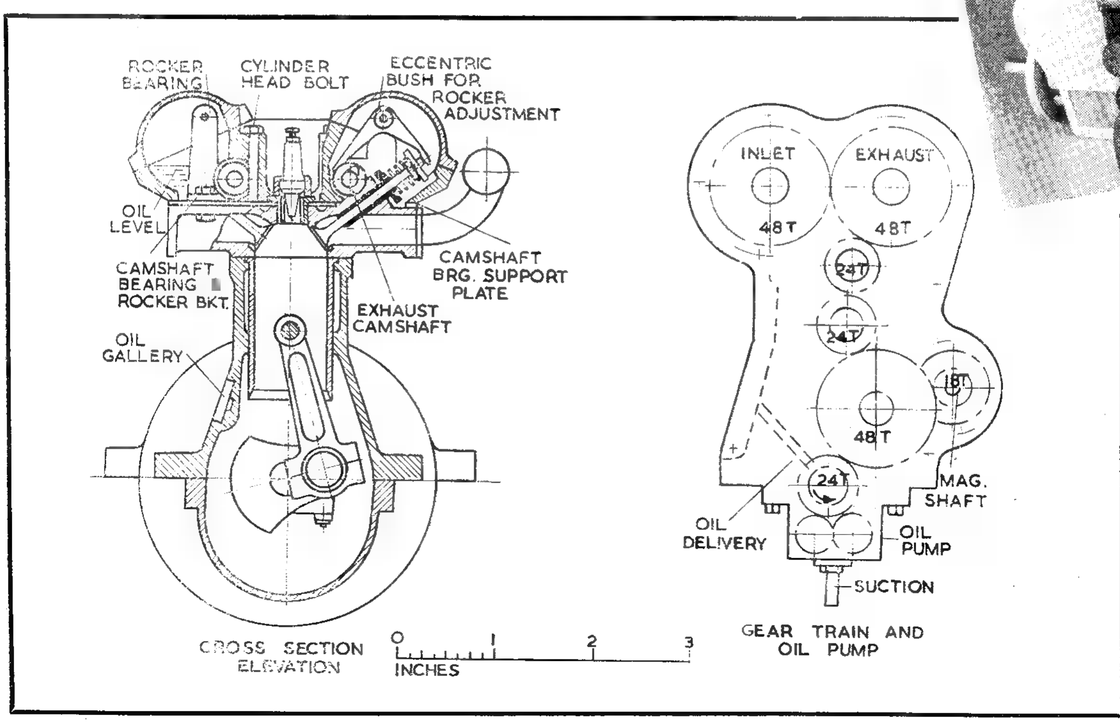
The design was worked out in detail and built before any other parts of the engine were started. At that time, I was quite convinced that magneto ignition was the answer to ignition problems in models and nothing has altered my opinion since. If the magneto had not been a success, I doubt whether the engine would have been built at all.

Engine Layout

Having completed and tested the magneto to my satisfaction, the layout of the engine was developed. A robust and rigid design was the aim and the possibility of supercharging was considered as an experiment, after the engine had been run normally. For this reason, a seven-bearing crankshaft as incorporated as a reasonable combustion chamber design, and the modern tendency for the short stroke engine made the distance between the cylinder centres rather large. The problem of obtaining a reasonable combustion chamber was solved by placing the plug in the centre of the head and having the valves at 90 deg., similar to the well-known Riley design. Due to lack of space, this angle was later increased to 106 deg.



Below — Fig. 2. Scale drawings showing end elevations

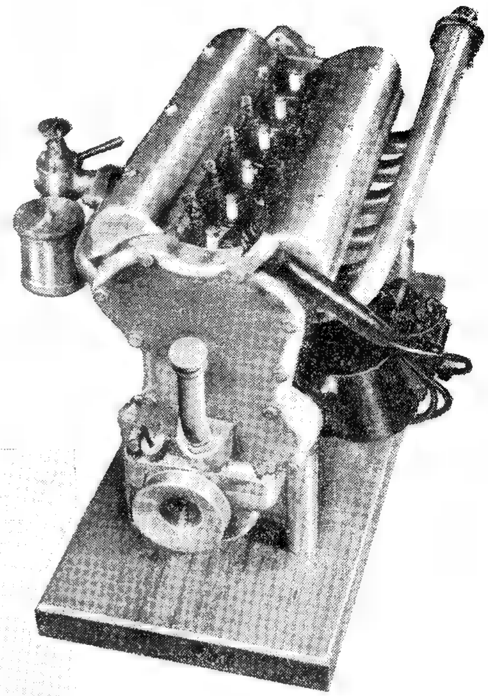


PETROL ENGINE

with Twin Overhead Camshafts

By

F. W. Waterton



Right—Three-quarter end view of finished engine

Lubrication

The problem of camshaft lubrication was considered, and in the interests of long life, the shafts were dropped as low as possible in the valve boxes, which were arranged to act as oil baths. The valves were operated by bell-crank levers, and the clearance adjusted by eccentric bushes in the rockers. To get

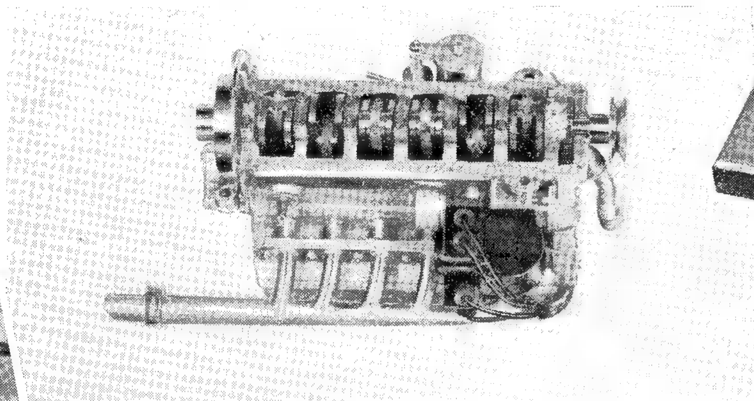


Fig. 3. Worm's-eye view, with sump removed

Left—Fig. 5. The finished six-cylinder magneto

the camshafts, cylinder head bolts and plugs all arranged round a $\frac{3}{4}$ in. bore cylinder was a bit of a puzzle, but by dint of a little cheese-paring and cutting grooves in the camshaft bearings to miss the cylinder head bolts, this was eventually managed. There remained the problem of cooling the head. I found there was no space left to put in the usual series of holes between the cylinders and so compromised by putting in two holes at the timing gear end, and passing the cooling water through the head and cylinder in series, going out at the flywheel end of the head and in at the same end of the cylinder. The water space surrounds each plug-hole and the upper sides of the ports. The water inlet and water pump could be near together, the pump being driven by the inlet camshaft and situated at the end of the gear train so that the water-pump acted as a very efficient vibration damper for the camshaft drive. This is very necessary on a twin o.h.c. design and quietens the gear train very much indeed.

Main Bearings

The lubrication of the main bearings was carried out by a gear pump immersed in the sump at the timing gear end. This pump was integral with the bearing cap on number one bearing and was driven by the same gear as the magneto and camshaft train.

Oil was drawn from the sump through a filter and pumped through an oil gallery on the inlet side of the engine to each main bearing. Oil ways between the big ends and main bearings were drilled through the crank webs, so that there was a complete way through the crankshaft from one end to the other via the main bearings. It was hoped to guard against a dry bearing by having two possible sources of oil for each. As the flywheel was to be totally enclosed and fitted with a clutch, the crankshaft was extended at the timing end and fitted with a starting pulley which looked very much like a fan pulley on a full sized engine. Also at this end were incorporated a filler and dip stick, and a drain plug for the sump. The drain plug was extended into the sump, and surrounds the suction pipe to the pump. The drain plug extension was fitted with a filter, so that, when the oil was changed, it would be a simple matter to clean the filter at the same time—a practice some full-sized engine manufacturers would do well to follow.

Clutch and Gearbox

These were added when the main engine had been completed, by which time a better idea of the amount of work involved in repairing a possible smash-up had been obtained. All tentative ideas of putting the engine in a hydroplane had been put aside. I had decided one man's lifetime would be much too short to keep the engine intact, if it were raced regularly. As an alternative, the drive was adopted for a twin screw steering boat, and a clutch and reversing gear incorporated to give fairly complete control.

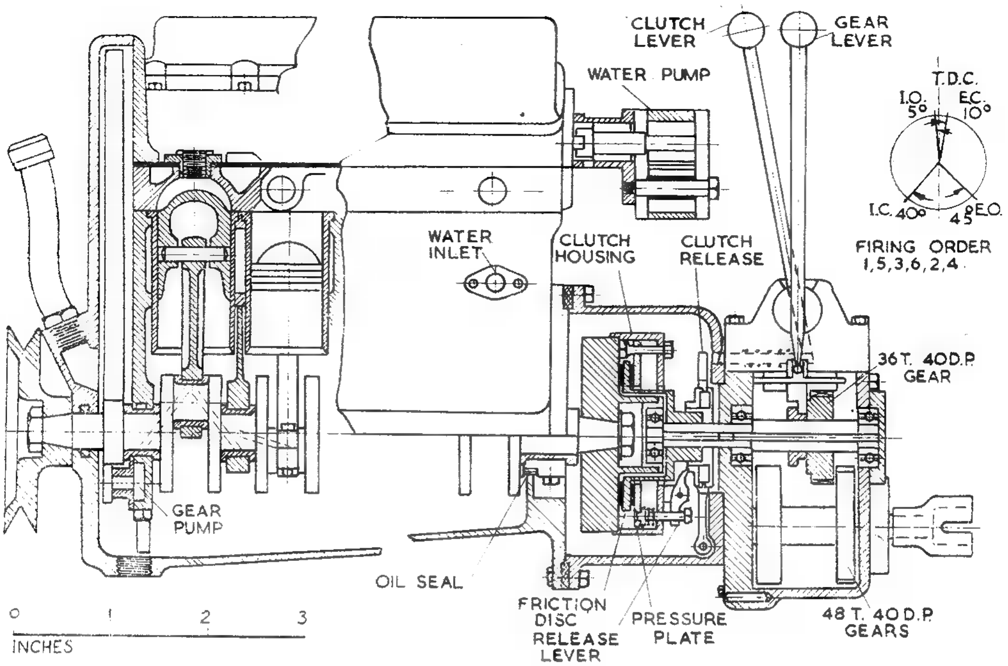


Fig. 1. Part sectional side elevation of six-cylinder engine

The propellers could be stopped without stopping the engine for removing weeds, and allow the engine to be started easily with the boat in the water.

The clutch is a single plate dry type, with a pressure plate held up by three springs inside a cylindrical housing. Three levers lift the pressure plate and free the friction disc, and are operated by a bakelite thrust-ring swung in a lever. The two propeller drives are geared together permanently and the gear on the main shaft drives alternatively through the port or starboard shafts. There are three positions for the lever—forward, neutral and reverse. The gearbox is fitted with filler and drain plugs for lubrication purposes, and all the three shafts run in ball-races. The driving shaft gear and clutch friction-plate each drive through two keys at 180 deg. as this allows them to slide easily under load and avoids the complication of fully splined shafts. The general arrangement of the engine is illustrated in the photographs and Figs. 1 and 2.

While the main features of the design have so far been successful, several modifications have been necessary. After a few minutes' running, it became very obvious that the output from the gear-type water pump was quite inadequate. The jacket water boiled in less than two minutes' running on a small throttle opening. The seat of the trouble lay again in the cylinder-head, and a much higher pressure was necessary than had been the case with previous water-cooled single cylinder engines.

A test was carried out to determine the amount of water necessary, by coupling the jacket to the domestic supply and weighing the amount of water collected in a bucket in one minute with the engine running at a suitable temperature, measured by a thermometer in the cooling water outlet. The head of water required was then found by running water from a can through the engine; the can was raised up until the same amount flowed through per minute as the engine required when coupled up to the tap supply. It was found that a flow of 27 cu. in. per min. with a head of about six feet was required at an engine speed of 4,000 r.p.m.

As the water passages could not be altered due to space restrictions a new pump was constructed. This was arranged to give four times the amount of water given by the original pump and great attention was paid to fits at the ends of the gears. The sideplates were made from bakelite fabric and the body and gears made the same length. The pump was assembled and run in by driving it in the vertical drilling machine at about 1,500 r.p.m. with the pump immersed in a bath of water. After a run of ten minutes' duration, suction and delivery pipes of the usual thin walled rubber tube were fitted, and the pump driven as before. The first thing that happened was the flattening of the suction pipe, which was remedied by fitting a thickwalled pipe. On starting up again, the delivery pipe blew off and drowned all and sundry with water. Clearly, this pump was doing all that was desired, but to find out what would happen if we restricted the output with a nozzle, the pipes were wired on and the drive started up. The jet hit the top corner of the garage roof, which is fifteen feet from the ground, showing little sign of being affected by gravity even then. Tests with the bucket showed that more water was being passed than was necessary so a by-pass was fitted to control

the output, and this has been adjusted on the engine to give a working temperature of about 60-70 deg. C.

The starting pulley was found to be too small in diameter, as the engine had the characteristic dragging pull often found in its larger brothers. A larger pulley has proved satisfactory, and the engine is a "first pull starter" under normal conditions. In Fig. 1 and 2, these modifications are incorporated in lieu of the original designs.

Several oil leaks, two in the crankshaft, one at the back of the flywheel, and the other behind the starting pulley have been cured by fitting synthetic rubber washers on the shafts. One from the timing gear case into the magneto was cured by a felt washer in the bearing housing at the drive end.

The dipstick has been a great boon, but accurate determination of the oil level is only possible with care. The diameter of the rod is $\frac{1}{16}$ in. and as the oil film in the hole cannot be sealed down, the hole has to be cleared of oil before a reading is taken. This is to be remedied by increasing the diameter of the stick to $\frac{1}{8}$ in. where it passes through the wall of the crankcase.

Some condensation occurs on the inlet valve-gear and the rockers and rocker bearing supports tend to go rusty. I have no answer to this at the moment except to give them a wipe over with an oily brush after a run.

The distributor H.V. terminals come rather close to the exhaust pipe from number two cylinder, but by shortening the ebonite terminals as much as possible and arranging the plug leads on the flywheel side of the terminal, sufficient clearance has been obtained to avoid burning the insulation. To alter the position of either the distributor or exhaust pipe would have meant a new magneto shaft and bearing housing, or a re-design of the exhaust ports.

I have a suspicion that Nos. 1 and 6 cylinders are robbing the others of mixture as shorting out these plugs seems to make more difference to the power output than the others, but I have not found this as yet. The compression is about the same on all cylinders.

The ringless pressed steel pistons are not too satisfactory, as they allow too much oil to be pumped into the combustion space and the plugs tend to oil up, particularly

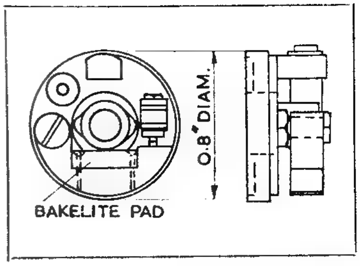


Fig. 6. Contact breaker

with the throttle on small openings. Overfilling the crankcase accentuates this effect, and I now feel that pistons with proper scraper rings would be better, although the compression is very satisfactory.

The valve-gear has proved very satisfactory and so far, the initial clearances have been maintained after four hours' running without any adjustment, and no sign of valve-bounce has occurred up to maximum revs. which are 8,500 with an ignition advance of 30 deg. No power output measurements have been made, mainly due to lack of time and facilities.

(To be continued)

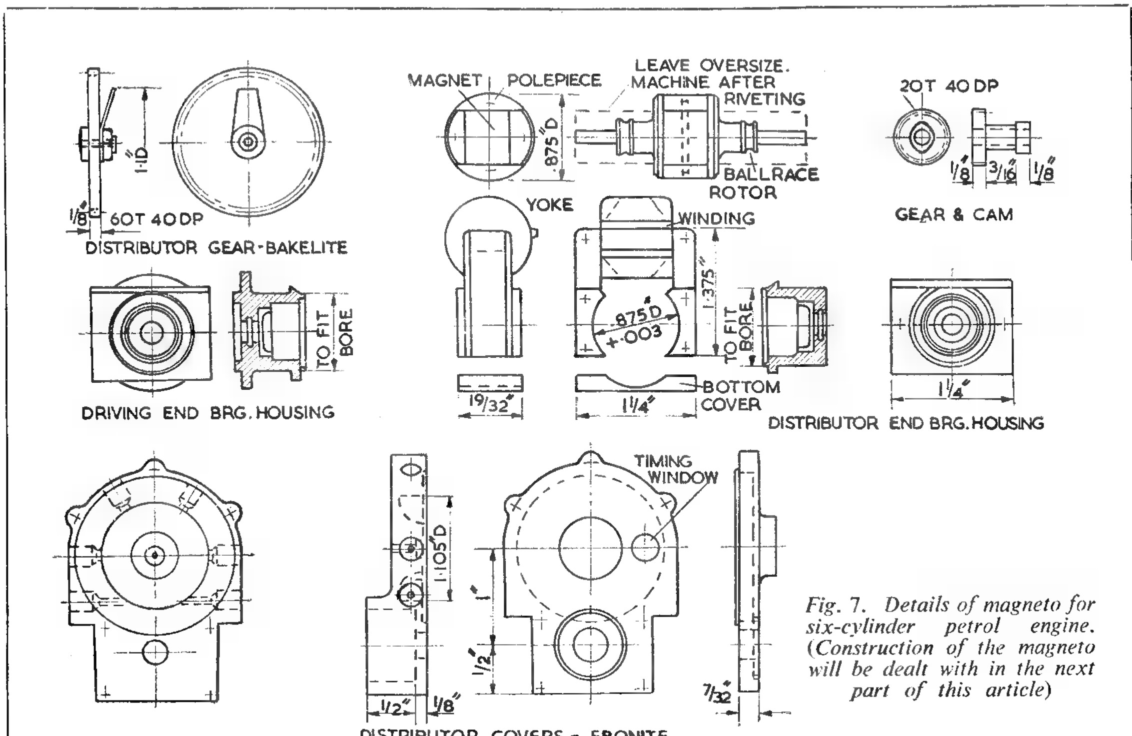


Fig. 7. Details of magneto for six-cylinder petrol engine. (Construction of the magneto will be dealt with in the next part of this article)

QUERIES AND REPLIES

" THE M.E." FREE ADVICE SERVICE. Queries from readers on matters connected with model engineering are replied to by post as promptly as possible. If considered of general interest the query and reply may also be published on this page. The following rules must, however, be complied with:

(1) Queries must be of a practical nature on subjects within the scope of this journal.
(2) Only queries which admit of a reasonably brief reply can be dealt with.
(3) Queries should not be sent under the same cover as any other communication.
(4) Queries involving the buying, selling, or valuation of models or equipment, or hypothetical queries such as examination questions, cannot be answered.
(5) A stamped addressed envelope must accompany each query.
(6) Envelopes must be marked " Query " and be addressed to THE MODEL ENGINEER, 19-20, Noel Street, London, W.1.

Oscillating Engine Design

Can you advise me as to the best ratio of bore and stroke for a single-acting oscillating engine, in order to obtain maximum efficiency and high revolutions?

L. T. (Harrow Weald).

It is impossible to make any definite ruling on this subject, as so much depends on other factors of design. Generally speaking, a long stroke is preferable for engines intended to run at comparatively slow speeds, and a shorter stroke for high speeds, as it enables the reciprocating forces to be reduced.

Most high speed engines have the bore and stroke approximately equal, and in modern practice it is rarely found any advantage to have the stroke more than one-and-a-half times the bore. We would, however, point out that so far as real efficiency is concerned, the oscillating engine in its normal simple form can never be a really efficient engine, owing to limitations in the method of distributing the steam, and its only real merit is its simplicity.

Converting a D.C. Fan Motor

Please tell me how I can adapt or convert a 230 volt d.c. fan motor to enable me to use it on 230 volt a.c. supply.

A.M. (Birmingham 30).

The great majority of d.c. fan motors cannot be converted to run on a.c. owing to essential differences in design. In many cases the field magnet used in a d.c. motor is of solid iron, and would become overheated by eddy currents if run on a.c.

In other cases laminated fields may be used, but the design of the laminations and the impedance of the windings make them unsuitable for a.c. supply. Yet again, some types of d.c. motors with laminated fields can be converted to run on a.c. by putting the two field coils in parallel, so as to reduce their impedance, but this can only be settled by experiment. Generally speaking, it may be said that motors which have been designed specifically for use on d.c. are rarely capable of working to their best efficiency on a.c.

Lathe Bench

I have purchased an E.W. 2½-in. lathe and would like your advice on mounting it on a bench. It is important that there should be as little noise and vibration as possible from the motor and the lathe. I have made the top of the bench from ½-in. plywood, and the frame with 2-in. × 1-in. spacers. Will this give adequate strength, and is it possible to place rubber washers between the lathe and bench top?

I should also like your advice on the best type of motor to use to give the most economical and silent running. Will an ex-Government ⅛ h.p. mains motor be suitable?

W.C.W. (Dagenham).

The material you suggest is definitely on the light side for a bench of this type, and although it would be adequate as regards actual strength, it would not damp out vibration so effectively as a thicker bench top. We would suggest that wood of not less than 1 in. finished thickness would be desirable.

The use of rubber washers or pads between the lathe and bench top is helpful in suppressing noise and vibration, and a further protection to avoid transmitting noise through the floor would be to mount the entire bench on rubber pads.

With reference to the type of motor, the most suitable motor would be a split-phase induction motor of about 1/6 h.p., assuming your supply is a.c. There is not much to choose between the economy and efficiency of the various reputable makes of motors, and standard types run at about 1,425 r.p.m., and are fairly silent. The use of a resilient mounting for the motor would further assist in quiet running.

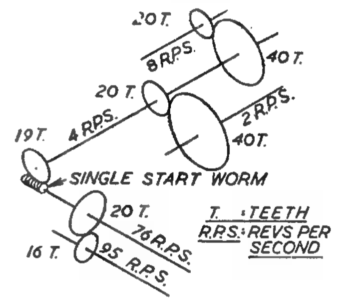
We cannot advise you with regard to your ⅛-h.p. mains motor, as you do not state what type it is. If it is the Universal type of motor having series winding and a commutator, it is extremely unlikely that it will be anything like as silent as an induction motor. The power specified will probably be sufficient for most of the work you require to do with this lathe.

A Gearing Problem

I have a motor with a 16-tooth gear on the shaft, running at a speed of 95 revolutions per second, and I wish to use this for driving two other shafts, one at 8 revolutions per second and the other at 2 revolutions per second. Due to the design of the motor, the 16-tooth wheel on the motor shaft cannot be changed.

J.D. (Southsea).

We suggest that the simplest way to arrange this gear is by a combination of spur and worm gearing, which can be done in the manner described and illustrated in the diagram. This entails the use of a



20-tooth gear on the first shaft, giving a 4/5 ratio from the motor, which is further reduced by a 19-1 worm gear giving a ratio of 4/95 relative to the motor. This can be stepped up to 8/95 by a 2-1 multiplying gear, and down to 2/95 by a 2-1 reduction gear.

Model Gas Turbines

I have read of an attempt to construct a model of a gas turbine, and have also read Colonel Bowden's " Jet Engines " in which he mentions the possibilities; also, the difficulties of a gas turbine in model form. Can you please tell me if anyone has successfully constructed a gas turbine yet, and if so, are there any plans available?

P.D.C. (Llandudno).

We regret that we cannot refer you to any information at present available on either design or construction of model gas turbines. We know of many attempts to construct them, but up to the present have no knowledge of any one that has been successful.

Model Power Boat News

BY MERIDIAN

A REVIEW OF RECENT REGATTA ACTIVITIES

POWER boats are a very popular subject for model-making, but it sometimes happens, that having built a boat, the constructor finds that there is apparently no suitable water available in his particular district—or if there is, one is not allowed to use it for such purposes !

An SOS to the editor of THE MODEL ENGINEER often follows such discoveries, and sometimes a suitable pond or lake not too far away from the inquirer's district is suggested. However, the number of *known* waters where power boats may be run, is generally limited to those where model power boat clubs are active, although there must be many more throughout the country, that are suitable.

In order to assist model power boat enthusiasts, it is desired to make a list of as many of such lakes and ponds as possible, and I would like to appeal to model engineers everywhere for information concerning them. Letters may be addressed to me via the editor, and the following details would be helpful : Situation and access; size and depth of water; natural or artificial; if circular course racing is allowed; permitted times for running of power boats.

Please do *not* send details of ponds which are otherwise suitable, but upon which there is a ban on the running of boats by the local authority.

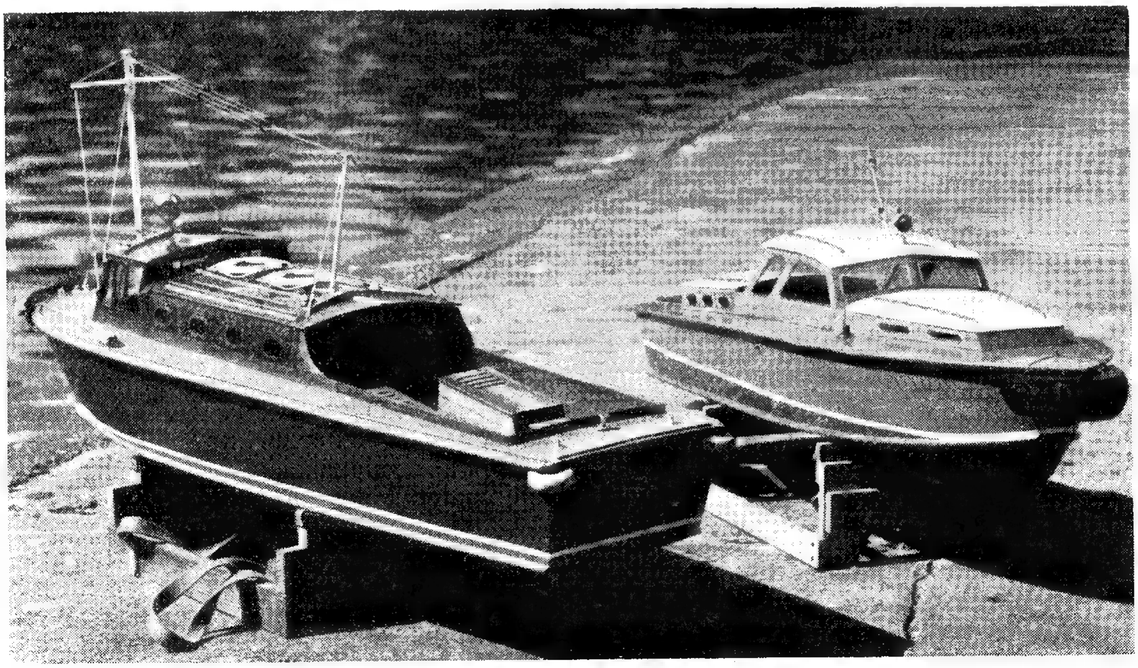
In the meantime, I propose to deal with some of the better-known power boat waters, from time to time, which may be of assistance to enthusiasts who are within reasonable travelling distance of them.

Although suitable waters are none too plentiful, we are much better off in this respect than other European countries. A few years ago M. Suzor made an urgent appeal for details of British ponds and lakes, in order to provide support for his appeal for better facilities in the Paris area of France. I do not know whether M. Suzor met with any success in the matter, but his efforts should be commended. One cannot expect support for model power boats without water on which to run.

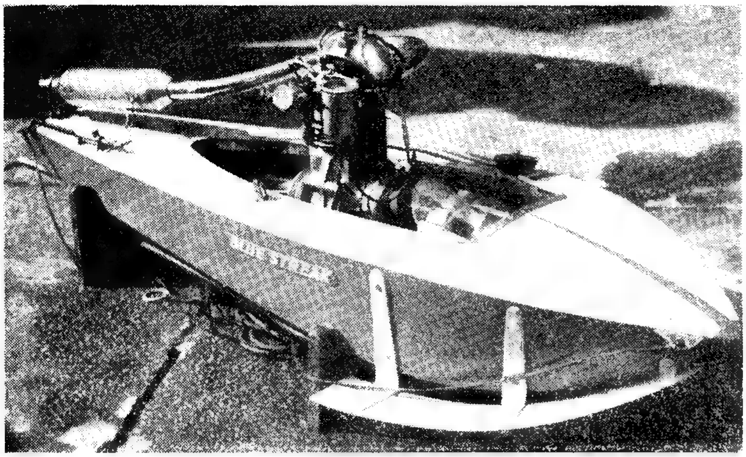
Our French colleagues are handicapped severely by lack of suitable practice waters, and I am sure that if this condition was remedied, we should see many more French entries in international events.

S.E. Association Regatta

The opening regatta of the 1953



Excellent performances were attained at the S.E.A. regatta by these radio-controlled boats, by G. Caird (left) and R. H. R. Curwen (right), both of the Bromley Club



Mr. S. Clifford's " Blue Streak " (" A " class), one of the four-stroke engined boats in the Coronation Speed Regatta

season was held recently at Brockwell Park by the South Eastern Association of Model Engineers. The regatta was mainly for the straight running boats, but there was one circular-course event in the form of a Nomination race over 500 yd. open to all classes of hydroplanes.

The other events included Steering Nomination, Team Relay Nomination, and a Towing event. A strong entry of launches and prototypes contested these latter events and all events combined to make an interesting day's sport.

The winner of both the Steering and Towing events was none other than our old friend Ted Vanner, now happily recovered from an illness that necessitated some time in hospital. The towing course was covered in 59.2 sec., 21 sec. better than his nearest rival ! *Leda III* is no stranger to towing, having taken part many times in the Farnborough Marrow towing contest back in pre-war days. In the Steering event, *Leda III* scored three inners to take first place. There was a tie for second place between Messrs. Rayman, Chandler and Benson, and upon the re-run, Mr. Chandler (Southend) was the successful competitor.

Results

500 yd. *Circular-Course Nomination Race*

(1) J. Benson (Blackheath), *Orthon*: Nom. 18 sec., actual 18.2 sec.

(2) C. Hancox (S. London) *Reowing*: Nom. 20 sec., actual 23.5 sec.

50 *yd. Straight Course Nomination*

(1) S. Fastier (Kingsmere), *Grenis III*: Nom. 24 sec., actual 24 sec.

(2) C. Morgan (Kingsmere) *Yama*: Nom. 28 sec., actual 29 sec.

Steering Competition

(1) E. Vanner (Victoria), *Leda III*: 9 points.

(2) Chandler (Southend), *Iope II*: 8points.

Towing

(1) E. Vanner (Victoria), *Leda III*: 59.2 sec.

(2) S. Dearling (Blackheath), *Maj*: 82 sec.

Team Nomination Race

(1) Kingsmere (Messrs. Morgan, Curtis and Fastier): Nom. 150 sec., actual 154.2 sec.

(2) Victoria (Messrs. Vanner, Gates and Chandler): Nom. 120 sec., actual 110.8 sec.

M.P.B.A. Coronation Speed Regatta

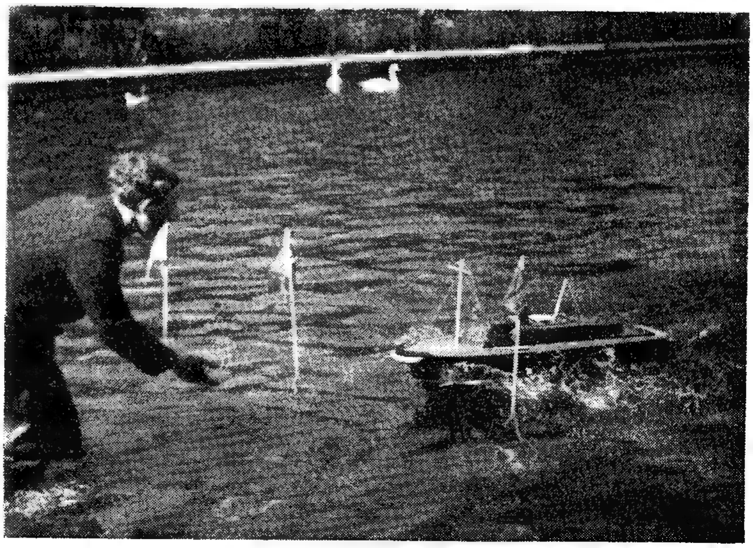
This event took the place of the old " International " and was held at Victoria Park, London, E.9. In spite of the somewhat early date in the model power boat calendar for this regatta, a large number of hydroplanes entered the various races.

A strong wind, blowing down the lake, was responsible for somewhat rough water and capsizes were frequent, especially among the lighter craft, although several of these proved themselves to be real " all weather " boats. Under these unfavourable conditions, speeds were on the low side in most of the events. However, the winner of any race is the boat to finish the course at the highest speed, *on the day*, and all credit must go to the winners and place winners for their performances.

The racing commenced with the " C " Restricted boats racing for the Wembley Trophy. The holder, S. Poyser, had very bad luck in this race when the con-rod fractured with only one lap to go. His new boat *Rumpus 6* looked very fast and stable when running, and should do well in future events. The eventual winner was K. Hyder (St. Albans), with his 10 c.c. boat *Slipper* 4 at the very good speed of 46.28 m.p.h. Second place was taken by J. Pinchin (Blackheath) with *Barracuda* at only a slightly lower speed.

Of the twelve entries for this race, exactly half managed to return a time at the end of the running.

The Class " B " Race for the



Mr. Caird's boat (not under radio-control) in the steering competition

Mr. E. Clark starting " Gordon 2 " (" A " class) in the Coronation Speed Regatta

Miniature Speed Championship proved even more troublesome for the competitors. At the end of the official two runs for each boat, only one competitor—R. E. Mitchell (Runcorn) with *Beta IV*, had completed the course, so the officials declared him the winner and ordered the other boats to re-run for second and third places. This time, two competitors, Messrs. Poyser and Jutton, completed and thus took second and third places respectively. *Beta IV*, Mr. Mitchell's boat, is engined by the four-stroke job formerly in *Beta II*. Another interesting boat was entered by Mr. Bamford (Aldershot), but unfortunately petered out before finishing the course. The flash-steamer *Vesta II* was obviously troubled by the strong wind affecting the lamps, and this probabably accounted for the low speed.

The Class " C " event, for the Wico-Pacy Cup, also saw many capsizes, but sufficient boats completed the course, so that no extra runs were necessary to fill places.

Mr. R. Mitchell, the winner of the previous event, was also scucessful in this race with *Gamma II*. Place winners were C. Stanworth and C. Stanworth Sen., with *Meteor* 4 and *May II* respectively, and both of the Bournville club. A new boat of unusual design, entered by L. Pinder in this race, suffered from starting trouble and the boat was not actually seen running. Another unusual boat was that entered by F. Walton (Kingsmere), which had the propeller in the centre of the boat, attached directly to the flywheel. With this boat, difficulty was experienced in keeping the line tight, but the experiment may well be more successful later on, since the boat seems to plane quite well.

The final event was the race for the International Trophy for Class " A " boats, and it was immediately noticeable that these heavier boats were much more at home in the disturbed water than most of the boats in the earlier races.

The holder of this trophy—J. Benson (Blackheath) with *Orthon*, made two good runs, and again emerged the winner. The fastest speed was 58.11 m.p.h. and this was also the best speed of the day. S. Clifford (Victoria), with *Blue Streak*, was second, and E. Clark (Victoria) with *Gordon* 2 took third place. J. Innocent (Victoria) with *Betty* had some bad luck when a transmission joint fractured and the engine screamed away at very high revs.; unfortunately, before it could be reached, a push-rod jumped out and caused other damage to be sustained. Incidentally, *Betty* has attained high speeds in recent practice runs, and looks like offering plenty of competition to the Class " A " lads.

Results

500 *yd. Race for the Wembley Trophy (" C " Restricted)*

(1) K. Hyder (St. Albans), *Slipper* 4: 46.28 m.p.h.

(2) J. Pinchin (Blackheath), *Barracuda*: 44.47 m.p.h.

(3) L. Pinder (S. London), *Rednip* 7: 42.44 m.p.h.

500 *yd. Race for the Miniature Speed Championship, Class " B "*

(1) R. E. Mitchell (Runcorn), *Beta* 4: 41.1 m.p.h.

(2) S. Poyser (Victoria), *Rumpus* 4: 42.3 m.p.h., on extra run.

(3) F. Jutton (Guildford), *Vesta II*: 26.5 m.p.h., on extra run.

500 *yd. Race for the Wico-Pacy Cup Class " C "*

(1) R. E. Mitchell (Runcorn), *Gamma II*: 42.41 m.p.h.

(2) C. Stanworth (Bournville), *Meteor* 4: 39.8 m.p.h.

(3) C. Stanworth Sen. (Bournville), *May* 2.: 37.5 m.p.h.

Class " A." " International Trophy "

(1) J. H. Benson (Blackheath) *Orthon*: 58.11 m.p.h.

(2) S. H. Clifford (Victoria), *Blue Streak*: 49.7 m.p.h.

(3) E. Clark (Victoria), *Gordon* 2: 47.35 m.p.h.

THE RETORT

DURING the first world war, one of our battleships developed a leak in the flanged joint of a large steam receiver situated in the centre engine room. It naturally got worse as time went on, and was carefully watched by the engineer officer, also by some of the E.R.A.s, one especially who was a " hostilities " man, of a quiet and thoughtful disposition, and who had to suffer a fair share of leg-pulling by some of the officers.

However, the time came to tackle the leakage, and after much " red tape," we were asked to give the lowest estimate of time it would take, as the ship would be out of commission, and this was an important matter at the time. The job was eventually begun, and the first difficulty presented itself by the bolts being rusted on (they were $1\frac{1}{4}$ in. dia.). After many hours' work these were freed and a few damaged, but the job was finished at last—after taking more than the estimated time.

During the cleaning-up period, our hostilities E.R.A. came on the scene, and one of two officers in conversation called to the E.R.A. and asked him what he thought of the job (hoping to get a compliment) but the answer was not quite as expected. " Well," said he, " I think if I had been in charge of the job I should have removed each bolt individually, during non-steaming hours, and made it an easy working fit, for I have calculated that 70 per cent. of the time has been taken up with 'freeing' rusty bolts. It may be the Navy's way of doing things, but as you asked my opinion, it is only fair to give you a truthful answer."—P. ROBINSON.

A First Floor Workshop

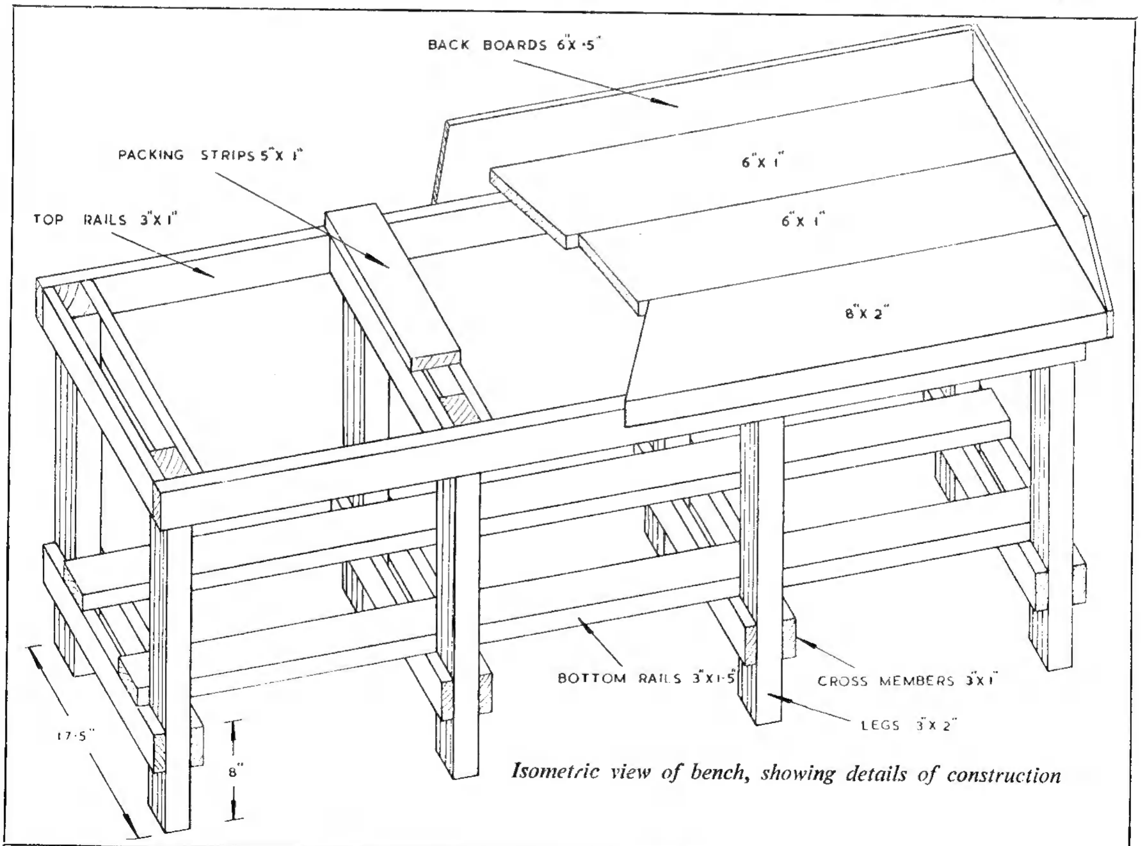
By G. W.

SOME twelve months ago we moved to a new home, and at long last the spare room workshop became a fact instead of just a pipe dream. The box room, about 8 ft. square, over the hall, was immediately allocated with general consent for use as a workshop. It was just the right size, facing due north, with reasonable natural lighting and no strong shadows. The legitimate occupants of the box room, it may be added, found their way into the roof and were suitably protected from the elements.

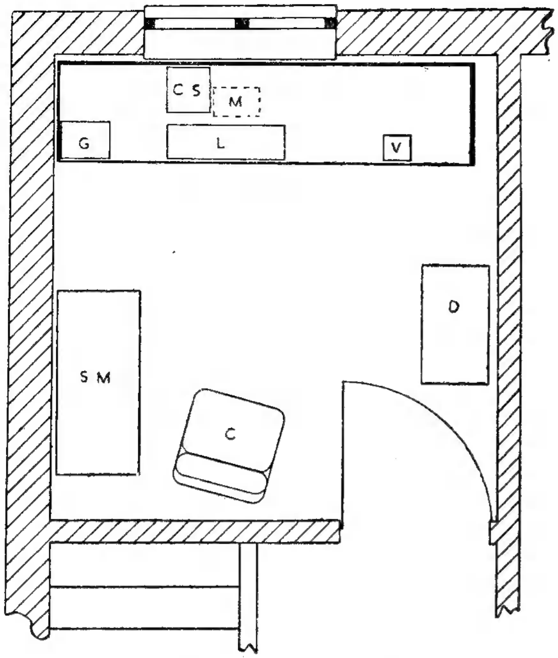
The use of a first-floor room for such a purpose is a mixed blessing in some respects. You certainly do not have to face the low temperatures of an outdoor workshop, but cleanliness, always desirable, now becomes essential unless landing and stair carpets are to suffer badly. With this in mind we decided to lay plain linoleum on the workshop floor and for easy cleaning it has proved its worth over bare boards a hundred times. It also makes it comparatively easy to find small screws or nuts that always get dropped.

At this point, the person to whom we like to refer as the "domestic authorities" very firmly pointed out that there were not going to be any "workshop widows" in this house. Fair enough! It is a point that is not always considered. This meant that precious space had to be given to the sewing machine and an easy chair, so that sewing, knitting and similar functions could be comfortably performed, whilst far more important activities were in progress on the other side of the room. At the same time it also meant that the good lady need not, on winter evenings, be isolated in another part of the house. That is definitely an advantage in these days of fuel shortage, no matter which side of the border one lives on.

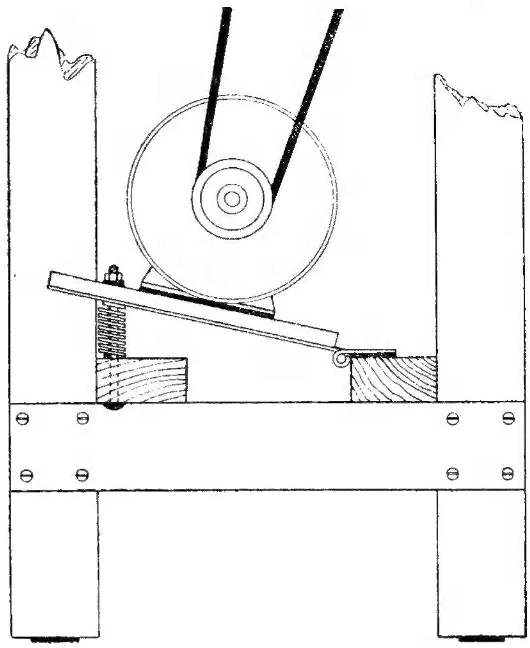
We had almost arranged for a point to be installed for a gas fire, when we remembered that suitable ventilation could not be arranged. For a gas heater to be satisfactory in a workshop, the only answer is to have one that fits into a fireplace so that the products of combustion go up the chimney. I once saw an M.L.7 that had gone red with rust in less than 24 hours. It was installed in a lightly-built and poorly-insulated workshop. When the first cold snap of the winter came along, a convector type gas heater in the centre of the room was turned on full blast. The products of combustion in the warm air, condensing on to the cold machine, would have ruined it in a very short time if immediate steps had not been taken to keep it covered up whilst



Isometric view of bench, showing details of construction



Plan of workshop, showing general layout. C—easy chair ; D—drill stand ; L—lathe ; SM—sewing machine ; CS—lathe countershaft ; G—grinder ; M—motor ; V—vice



The hinged motor mount

not in actual use. Needless to say, we laid on an electric fire, and have had no rusting troubles. It has often been said, and will bear repeating : Never, never use gas in your workshop if you can possibly avoid it, not even that little bunsen you keep for silver-soldering boiler fittings and the like. Do it outside, or in the kitchen, where gas is in use, anyway.

As only small models were contemplated, the most suitable arrangement appeared to be a full-length bench along the wall by the window, to take a small lathe, tool grinder and vice. This, I thought, would still leave sufficient space for the usual bench work such as fitting, marking-out, and assembly. In practice there have been very few occasions on which a little more elbow room would have been desirable. I already possessed a $\frac{1}{4}$ in. Champion drill mounted on a small stand and fitted with treadle drive.

The bench itself was the result of considerable thought. It is comparatively narrow ; 20 in. wide, to be precise. That doesn't sound much, but consider for a moment just how much of a bench is normally worked on, very little more than the front 12 in, I'll be bound. The back of a wide bench invariably gets cluttered up with tools that cannot be found when wanted, odd bits of material and all sorts of junk. A narrow bench forces the issue ; if you want to work you must be tidy. In any case, why build a fairly expensive bench to provide very doubtful storage room ? When floor space is limited, and you want a place for storage, it is far better to spread upwards rather than sideways.

On the score of solidarity, the weight of the lathe, motor, bench and materials stored underneath are more than enough to prevent rocking when heavy filing is in progress. Sliding is prevented by the insertion of rubber door stops in holes bored in the legs. These door stops were pressed in until they projected about $\frac{3}{16}$ in. from the wood, and are also very effective in stopping noise transmission.

I am not a very enthusiastic woodworker, and the prospect of making quite a number of joints, plus the gluing and pegging of same, did not appeal to me a bit. The bench was to be a means to an end, and not an example of the joiner's art. All the pieces were, therefore, screwed together, and the structure has proved to be perfectly satisfactory in all respects.

You will observe that the legs have cross members on each side, at both top and bottom. This arrangement gives a large contact area for both the bottom rails and top boards, and contributes a lot to the general rigidity of the assembly.

The four leg units were completely assembled, and all other timber cut to length, outside the house, so that no real woodworking had to be done indoors.

After cutting, and before assembly, all the pieces were given two applications of Cuprinol as protection against any possible infestation by woodworm.

The bench was finally put together *in situ*, the four leg units being stacked together so that the bottom rails could be inserted.

Now that certain foreign hardwoods can be obtained without a licence, there was no difficulty in getting the timber. In this case, Opura was used for the three top boards, and Obeche for the framework. Obeche is a fairly light material, rather like what is commonly known as deal, and very easy to work, although classed as a hardwood. Opura is rather heavier and darker, but quite suitable for the job. When freshly sawn, it gives off rather a strong odour which hangs about for a week or more.

(Continued on page 779)

READERS' LETTERS

● **Letters of general interest on all subjects relating to model engineering are welcomed. A nom-de-plume may be used if desired, but the name and address of the sender must accompany the letter. The Managing Editor does not accept responsibility for the views expressed by correspondents.**

THE NAPIER "DELTIC" ENGINE

DEAR SIR,—Congratulations to Mr. Edgar T. Westbury on his article on the above subject, appearing in the May 21st issue of THE MODEL ENGINEER.

A masterly piece of lucid writing. To my mind it is a pity he feels the need for introducing such an article on an apologetic note.

There must be many among our readers who are engineers at heart, even if the making of a working model of a "Deltic" be hopelessly beyond their practical skill.

An article such as this contributed by a man who is a competent writer as well as being a competent engineer (*rara avis* !) forges anew the link that binds us all in a happy fraternity.

Let us have more such.

Yours faithfully,
Pitchford. P. WATKINS

IMPROVING THE HOT-AIR ENGINE

SIR,—It is self-evident that great power output from hot-air engines depends upon increased m.e.p. (mean effective pressure) on the power stroke. This can only be obtained by increasing (*a*) the amount of air before expanding it by heat, and (*b*) by applying the heat to this air in some manner that entails the least loss or wastage.

Both these problems have long been solved and hot-air engines have revolutionised transport by land, sea, and air, for the fact is that the i.c. engine, even the jet, is nothing more nor less than the hot-air engine provided with a pre-compressed cold charge, and the most efficient method possible of heating it, within the cylinder itself. The fuel, be it petrol, diesel oil, gas, or coal-dust, has the function solely of providing heat, and its own combustion into CO_2, and water-vapour is an almost negligible factor in the pressure rise on ignition. This will be apparent if anyone stops to consider the quite minute quantity, in weight, utilised at each power stroke, yet, for all that, the new hot-air (i.c.) engine is a terrible heat-waster and works at high temperatures which are by no means desirable, but enforced.

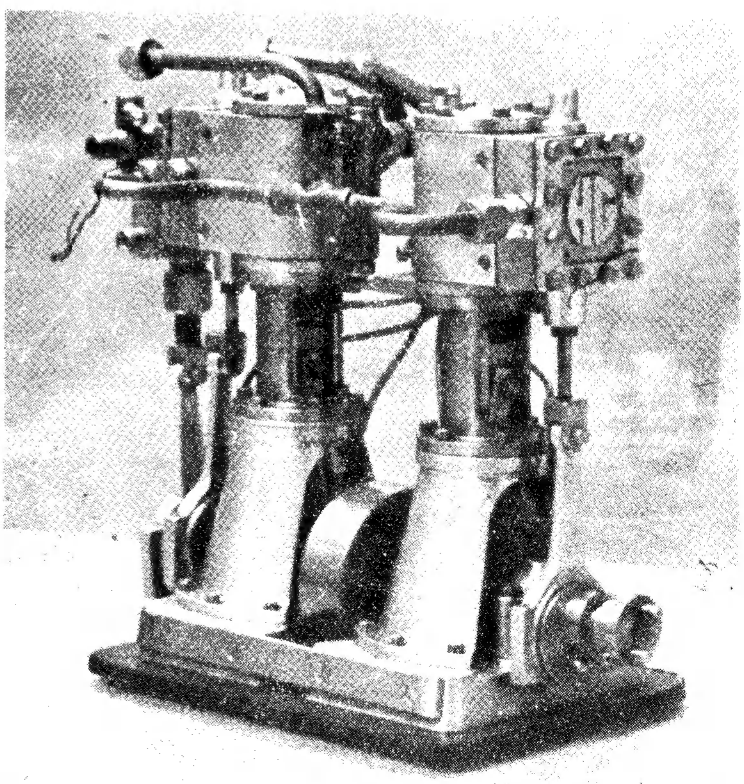
We speak of "air-cooling" and "water-cooling" without perhaps realising that in these terms alone lies a staggering economic loss to humanity, and they are employed solely as the only means by which metals and lubricants can remain effective in the unavoidable high temperatures encountered.

Mr. Westbury can tame his dragon and make it purr to any tune he calls, but it still breathes fire and wastes heat into the atmosphere, to the impoverishment of the human race; speed-boat fans included !

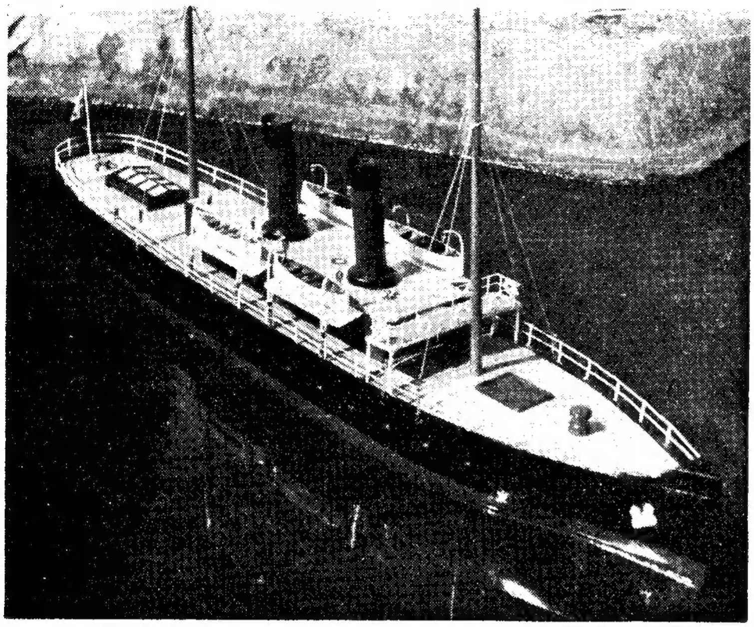
Yours faithfully,
Bedford. F. D. BROWNSON.

MODEL ENGINEERING IN RETIREMENT

DEAR SIR,—It is with great diffidence that I send you photographs, but I do so at the special request of Mr. Gosden, who thinks they may be of interest. In January 1951, you published an article by him, on "A $\frac{3}{4}$ in. × $\frac{3}{4}$ in. Vertical Steam Engine." This supplied exactly what was wanted for renovating a steamboat a brother and I made 55 years ago. Mr. Gosden kindly procured me the castings for two engines which I built and put together in tandem with the addition of an eccentric-driven pump, as shown in the photograph. The



A twin-cylinder engine adapted from Mr. H. Gosden's design by the Rev. G. S. Long



A 4-ft. model of a Channel Islands steamer, circa 1895

practical result is most satisfactory.

The other photograph shows the 4 ft. model on the lines of the then latest Channel Islands steamers *Reindeer* and *Roebuck* running from Weymouth in about 1895. (The *Roebuck* still runs but has had a funnel removed.) My brother made the hull and I saw to the engines.

From those days my boyhood hobby entirely lapsed until I took it up again eighteen months ago in retirement. By the help of your "M.E." articles I have made four Sherrell refrigerators for my family, a Cowell drilling machine, Mr. Gosden's engine for the completely renovated steamboat, and am nearing the completion of "L.B.S.C.'s" *Little Dot*. Castings of his S.15 are on order for the next job.

You see what a book THE MODEL ENGINEER has been to me in my old age, for which you have my grateful thanks.

Yours faithfully,

Broadstone. (REV.) G. S. LONG.

STROBOSCOPIC EFFECTS

DEAR SIR,—There are two possible causes of this phenomenon which do not appear to have been mentioned.

(1) Some tubes have a short length of clear glass at each end and through this the "flicker" from the heating elements can escape. The cure is obvious—cover up the small portion of clear glass tube.

(2) Other tubes, when new, appear as though the whole column of light is moving in the tube in the form of a spiral. Normally, this effect only lasts for a short time and the tube then behaves normally. If the effect persists, however the tube should be replaced.

Yours faithfully,

Hampton Hill. O. G. SANDFORD.

CORLISS VALVE GEAR

DEAR SIR,—With reference to the enquiry from "J.H.G." on Corliss valve gear, this reader and others will doubtless be interested to know that I hope to deal with the subject fairly fully in the "Talking About Steam——" series of articles. There were, of course, a great many varieties of so-called Corliss gear, and it will not be possible to mention them all by any means, but the principal ones will be illustrated and described, with your permission.

Meantime, "J.H.G." may care to look up the article by "Northerner" published about a year ago in THE MODEL ENGINEER, in which was described and illustrated the late Amos Barber's lovely mill-engine. This article includes a good description of the working of the Inglis and Spencer variety of Corliss gear, illustrated by close-up photographs of the model valve-gear.

Yours faithfully,

Sheffield. W. J. HUGHES.

A First Floor Workshop

(*Continued from page* 777)

All the material used in this bench was obtained from the local timber merchants for under five pounds, sawn, planed to size and delivered, which is a pretty reasonable figure.

Having disposed of my old plain lathe, the time was now ripe for the acquisition of a new machine. I had previously owned two lathes that came into the "baby" class, and knew their limitations well enough. In the course of my daily toil, at one period, I had also used much larger machines, so very definite views were held as to what was required. Something in between was the answer, and eventually an "E.W." machine with all its attachments was purchased. This lathe has had a lot of use in the last twelve months or so, and its performance leaves nothing to be desired. For its size, it is undoubtedly in a class on its own.

The lathe was mounted on the heavy front board of the bench, with the countershaft to the rear, as far away as the back board would allow.

A 1/5 h.p. *ex*-W.D. motor had been obtained previously. This is a Hoover capacitor-start job, and, I believe, came off a radar cabin, where it had done duty as a blower motor. As it had been flange mounted, there were no feet on the frame, so it was held down on to two wooden vee blocks by bands of 1 in. by $\frac{1}{8}$ in. strap-iron. The vee-blocks were screwed to a thick board, which in turn was hinged to the rear bottom rail of the bench. The front end of this board was held down on to two compression springs by means of coach-bolts, as illustrated. With this arrangement, belt tensioning is an easy matter, also, the motor is out of the way of flying swarf, and does not take up valuable bench space.

Noise transmission was again reduced by the insertion of rubber between the motor board and the bench frame.

Neither the height nor the length of the bench has been mentioned. The height, of course, was arranged to be such that the vice jaws were at elbow level. The length was made about 6 in. less than the distance from wall to wall, in order that sheet material could be stored at one end.

The two end sections of the bench frame will eventually either be boxed in to form store cupboards, or fitted with drawers.